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NEW and CORRECT TABLES

For Computing in a conciſe Manner,

The Places of the LUMINARIES;

Digeſted from

NUMBERS

Founded on

The lateſt Obſervations;

All the TABLES hitherto publiſhed making the
Apogé of the Sun about Seven Minutes too far.

The TABLES of the MOON are diſpoſed according to Sir *Iſaac Newton*'s Theory, from whence each Equation may be taken out with the ſame Eaſe as that of the Sun's Centre, and conſequently her Place be obtain'd in a Tenth Part of the Time of any other Method extant; with Remarks whereby the ſaid Theory is made to correſpond with Obſervations.

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There is likewiſe introduced,

The *Theory* of DECIMAL ARITHMETIC,
Both Terminate and Circulate;

Together with their Demonſtrations, which by the late ingenious
Mr. *Cunn*, and other Authors, are omitted.

By *CHARLES BRENT.*

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TO

William Jones, Esq;

Fellow *of the* ROYAL-SOCIETY.

SIR,

WHEN a Treatiſe of this kind makes its Appearance in the World, it naturally ſeeks the Sanction of one, who is excellently ſkill'd in the Science it treats of; for which you are not only eminently diſtinguiſh'd, but likewiſe, for Encouraging all Productions that may be of Uſe and Service.

Theſe, among many other valuable Qualities, which you poſſeſs, together with the Belief, that this Treatiſe will not be unacceptable to the Public, has embolden'd me to addreſs it to you.

I am not inſenſible (with the great Mr. *Lock)* that I here make you ſuch a Preſent, as the poor Peaſant to his rich and wealthy Neighbour, by whom the Baſket of Flowers was not ill received, tho' he had more Plenty of his own Growth, and in much greater Perfection.

I am, SIR,

Your moſt humble Servant,

CHARLES BRENT.

THE

PREFACE.

It may not be altogether unneceſſary to ſet forth what gave riſe to this Treatiſe, as alſo the Methods by which the Tables contained herein were conſtructed.

And, firſt, obſerving that in order to reconcile Hiſtory with Chronology, &c. there wanted ſome Expedient, whereby from certain Data, the Times and Seaſons of memorable Tranſactions and Phænomena might with Eaſe and Certainty be pointed out: This put me upon deviſing the Chronologer; *but with no farther View, at firſt, than that of my own private Uſe; the contriving of which from time to time, furniſhed me with Methods by which the Tables were conſtructed; and which again in return were reciprocally conducive to the modulating and digeſting the* Chronologer *into the Order it now ſtands.*

The Manner of conſtructing the Tables of the Sun, is obvious from what is laid down in p. 101, &c. *And the Reaſon why its Mean Places, as well as thoſe of the Moon, are tabulated to every Day at Noon in the Radical Year* 1736, *inſtead of the Mean Motions as uſual, is (beſide other Advantages) that Tables of the Mean Motions of the Sun from the Moon, as alſo the Calculations deduced from thence for finding the Mean Time of Eclipſes, are thereby fully ſupplied.* See p. 292, &c.

The Mean Motion of the Sun to Thirds, for a Year of 365 *Days, according to the lateſt and moſt accurate Obſervations, is found to be* $11^s\ 29^\circ\ 45'\ 40''\ 17'''$. *The Radical Year* 1736 *is Leap-Year, which therefore, conſiſts of* 366 *Days; the Mean Place of the Sun on the laſt Day of the ſaid Year by the Tables is* $9^s\ 20^\circ\ 59'\ 56''\ 11'''$, *from which if there be taken* $9^s\ 21^\circ\ 14'\ 15''\ 54'''$, *the Mean Place on the firſt Day of the ſaid Year, the Difference* $11^s\ 29^\circ\ 45'\ 40''\ 17'''$ *will be the Mean Motion for* 365 *Days, and is as above, which proves the Correctneſs of the Tables; in like manner may the Correctneſs of the other Tables be proved.*

The Tables of the Sun, at firſt were deſigned to Seconds of a Degree only, ſee *Examples* p. 109. 113. 117. *but are ſince computed to Thirds; in which, and in the Example* p. 121. *the Motion of the* † *Apoge was omitted, but is ſince added in the Mean Places for every Day throughout the Radical Year; therefore I refer you to the ſame Example,* p. 164.

† 10 Thirds *ferè* each Day.

The Tables of the Firſt or Annual Equations of the Moon, Apogé, and Node, were conſtructed, as directed by Sir Iſaac Newton.

The Second Equation of the Moon, when her Apogé is in the Octant of the Sun, and the Sun at the ſame time in his Apogé, Sir Iſaac *makes to be* 3′. 34″; *but if the Sun ſhould be then in his Perigé, it is to be increaſed by* 22″; *in all other Situations the ſaid* 22″ *is to be proportioned as the Differences of the Cubes of the Diſtances of the Sun from the Earth, which muſt then be added to the aforeſaid* 3′. 34″; *but if the Moon's Apoge be not at the ſame time in the Octant of the Sun, the ſame is to be reduced thus; as the Radius, is to the Sine of the double Diſtance of the Moon's Apogé from the Sun, ſo will the aforeſaid Equation (which would have taken Place, if the Moon's Apogé had been in the Octant of* ☉) *be to the preſent Equation out of the Octant.*

The Third Equation is 47″, *when the Moon's Node is in the Octant of the Sun; but, when not therein, it muſt be proportioned as the former, with the double Diſtance of the Node from the Sun.*

The like is to be obſerved with the reſpective Numbers and double Diſtance of the Sun from the Moon in the Variation, in which Sir Iſaac *makes the greateſt Increment, the Sun being in his Perige, to be* 4′ *or* 240″, ſee *the* Chronologer, *where the ſaid Increment is, by Sir* Iſaac's *aforeſaid Rule, computed to every* 6° *of Anomaly, which, as may be eaſily ſeen, is ſufficiently exact. For the Uſe thereof,* ſee p. 320. 328.

The Fourth and Seventh Equations are proportioned alſo as the former, with their reſpective ſingle Diſtances, &c. ſee p. 127. 136.

The Fourth Equation, ſo uſed by ſome, Sir Iſaac *makes the Second Equation of the Moon's* [*] *Centre, and therefore to be applied after the Elliptic Equation, in which Caſe the Numbers to enter the Table for taking out the ſaid Equation, may be* 12° 18′ 40″ *odds,* viz. *the greateſt Second Equation of the Moon's Apogé, the which will create a Difference of about* 30′ *in the Place of the Moon; but if the ſame be applied after the Variation, in that reſpect the Difference will be inconſiderable, when it will become the Sixth Equation, agreeable to Sir* Iſaac's *Theory, which Method is (as it muſt always be according to the Theory) purſued in re-computing the Moon's Place by the* Chronologer *for* Dec. 12, &c. 1738. ſee p. 143, &c.

The Principles for obtaining the Second, Third, and Variation Equations, in or out of the Octants, being the ſame; if Unity, with ſo many Cyphers as convenient, be compared with each reſpective Equation in the Octant, and the ſame reduced to each Degree of the ſaid Octant, according to the ſaid

[*] Prin. p. 302. Engliſh Edit. Vol. II.

ſaid Principles (which Calculi will be found vaſtly eaſy by Logarithms) you will thereby have a Table of Decimal Multiplicators ſerving to the ſaid Equations; and tho' obtain'd by the double Diſtance, will be beſt to ſet againſt the Single of each Degree of the Octant; by which means the ſingle Diſtance in entering the ſaid Table at any time, may be made uſe of inſtead of the Double.

In the Chronologer, *the ſaid Multiplicators are only to every other Degree of the Octant, under the Title, Second, Third, Var. Sixth, and Seventh Equations.*

Next, entering this Table with the proper Diſtance, and taking out the correſponding Multiplicator, by which multiplying the reſpective Equation, as would have taken place in the Octant, gives the preſent Equation required.

Applying half of the reſpective Diſtances, uſed in the Sixth and Seventh Equations, to this Table of Multiplicators, the ſame will be made to ſerve for them alſo; as is plain, each Multiplicator anſwering to Double the Diſtance entered with. See p 127. 136.

Having, by the aforeſaid Method, calculated the Table of Decimal Multiplicators, all the reſpective Tables, with their proper Numbers were computed thereby, as alſo the Increments to the Second and Variation Equations, viz. *ſuppoſing the greateſt Increment to take place.*

*And here it is to be obſerved, that the Increment in the Tables, anſwering to any Diſtance entered with, is the greateſt reduced to correſpond with the ſaid Diſtance; but when any other Increment than the greateſt takes place, as found by the Sun's Mean * Anomaly, the aforeſaid Increment, taken out of the Table, will require a Reduction,* viz. *As the greateſt Increment, is to that anſwering the preſent * Anomaly, ſo is the Increment in the Table, correſponding to the Diſtance enter'd with, to the preſent Increment required.*

Wherefore the Ratios between the greateſt Increment, and thoſe anſwering to every Degree of Anomaly, will be common Multipliers; by which multiplying the tabular Increment, gives the true, as before: And by this Method were the Multipliers computed to the Increments of the Second and Variation Equations.

The next Equation to be encounter'd with, being the Elliptic, the firſt Thing taken under Conſideration, was the common Proportion for obtaining the mean from the true Anomaly: viz. *As the Apogeal Diſtance is to the Perigeal, ſo is the Tangent of half the mean to the Tangent of half the true Anomaly. The Apogeal Diſtance is the Eccentricity added to the mean Diſtance of the Moon from the Earth; ſuppoſe* 1,000,000 *Parts: And the Perigeal Diſtance is the ſame, ſubtracted from the ſaid mean Diſtance: This being*

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* *Vide* Chronologer,

*being done with the reſpective † Eccentricity to each Degree of * Annual Argument; by adding the Arithmetical Complement of the Log. of each Apogeal Diſtance, to the Log. of the Perigeal; there will thereby be obtained a Table of conſtant Logarithms, to be at all times taken out, as the Eccentricities* p. 140. *and in this manner was the Table conſtructed* p. 257; *the Uſe of which you have in* p. 145, &c.

Upon ſhewing theſe conſtant Logarithms to an ingenious Friend and Acquaintance Mr. William Beetenſon, *of* Exeter-ſtreet, *Surgeon, he believed he had the ſame Numbers by him in Manuſcript, but upon comparing, we found a ſmall Difference only between ſome of them in the laſt Place to the Right-hand, occaſioned by the like Differences in the Eccentricities from which mine were computed.*

In the ſame Manuſcript were likewiſe contain'd ſeveral Radices of the Sun, with the Motion of his Apoge and Anomaly for ſtated Times; where finding the Apoge of the Sun to be about 7 min. ſhort of what it is made by all other Tables extant, which correſponding with the lateſt Obſervations, I therefore compos'd all the Solar Tables agreeable thereto.

The Motion of the Apoge of the Sun for a Year, is now obſerved to be 1'. 0''. 40''', *but by Mr.* Flamſteed's *Tables it is made* 1'. 3'';

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† See p. 140.

* *Viz.* Moon's Apoge firſt Time Equated à Sun.

ſuch a Difference in Proceſs of Time will amount to a conſiderable Error.

But to return to the Elliptic Equation of the Moon; the next thing was to diveſt the ſame from the Logarithmic Operations, as directed p. 145, &c. *for which Purpoſe the Table of the mean Elliptic Equation,* p. 218. *was conſtructed, as alſo thoſe for the Reduction of the mean to the true Elliptic Equation to every other Degree of* * *annual Argument, and was at firſt to every three Degrees of Anomaly; but finding, that if the ſaid Reduction-Table was compiled to every Degree of Anomaly, the Tablet-Work,* p. 134. 154. *might be greatly ſhorten'd: I accordingly computed it thereto, by which the ſaid Reduction may at all times be obtained with ſcarce any more Trouble than bare Inſpection.*

The Tables, according to Mr. † Machin, *were conſtructed from his Numbers, given in his Treatiſe of the* Laws of the Moon's Motion, *annexed to the latter End of Sir* Iſaac Newton's Principles *in* Engliſh, *where he makes an Equant, to be applied to half the mean Anomaly, for obtaining the Elliptic or Equation of the Moon's Centre, amounting when greateſt to* 2 *Minutes,* 2 *Seconds, and tho' Sir* Iſaac, Lib. I. Prop. 31. *gives a Law for obtaining ſuch Equant, yet he no where takes notice of it in the* Theory, *but directs the ſaid Equation of the Centre to be found by the common Methods* (Prin. En. Vol. II.

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* Diſtance of Moon's Apoge firſt Time Equated à Sun.

† See p. 213. 214. 215. 216. 265.

p. 302.) *by which it appears, as if ſome of the ſeven Equations were uſed only as an Approximation, for which this Equant might compenſate.*

The moſt eſſential Equations of the ſeven, are the Annual, Elliptic, and Variation; the Sum of the other four when greateſt amount to a little above 9′, the Difference between which Sum and the Double of this † *Equant alſo when greateſt is 5 Minutes, this Error the* Theory *is often found liable to; and by the ſame Reaſoning, ſhould be likewiſe to their Sum,* viz. *13′, which ſometimes it has not been far ſhort of.*

Hence, making uſe of no more than the Annual, Elliptic, and Variation Equations, from the Tables according to Mr. Machin, *in computing the Lunar Eclipſe,* March 15. *(the Radical Year)* 1736, *the Computus will be found to correſpond exceeding near to Obſervation; whereas if other Equations be introduced, which in this caſe are only the* * *ſecond and ſixth, the former amounting to above* 3′ *ablative, and the latter to about* 2′ *alſo ablative, it will thereby make the ſaid Eclipſe to fall about* 10 *Minutes in Time ſhort of Obſervation: And as both the ſaid Equations are Ablatives, it is a corroborating Teſtimony, that they are altogether unneceſſary in the Syzygys.* See *the Computus, at the End of the Book.*

Alſo in computing the Place of the Moon for the Occultation of Aldebaran, Dec. 12. 1738.

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† See p. 145 and 147.

* The third and ſeventh vaniſhing.

1738. *by making uſe of the aforeſaid three Equations only, that of the Reduction to the Ecliptic excepted, the ſame will be found to correſpond with Obſervation; when, if it be computed according to the* Theory, *it will be found to fall ſhort about 7′ in Time; which is a farther Proof that no more of the Equations are neceſſary either in or out of the Syzygys, as has been often verified by ſundry Obſervations of the Moon on the Meridian, which I received from my Friend* John Bevis, *M. D.*

If Computations by this Method be compared with a proper Set of Obſervations, and ſhould be found to deviate therefrom, Rules for obtaining the Moon's Place à poſteriori *may from thence be deduced; but to have it* à priori, *muſt remain among the* Deſiderata, *'till ſome great Genius ſhall oblige the World with a farther Diſcovery than has hitherto been made; but this is expected in the* Theory of Gravity, *promiſed by that excellent Mathematician, the aforeſaid Mr.* John Machin, *Profeſſor of* Aſtronomy *in* Greſham College, &c.

The Knowledge of Decimal Arithmetic being abſolutely neceſſary in the Uſes of the Chronologer, *and finding alſo that this Treatiſe might thereby be made independent of any other, gave occaſion for introducing the Theory thereof.*

The Doctrine of Circulating Numbers might with greater Propriety (if thoſe who firſt gave Name thereto had thought fit) have been called Novenal Arithmetic, as others are called Decimal, Duodecimal, &c. *the firſt being denominated by Nines, the ſecond Tens, the third Twelves,* &c.

I ſhall conclude this Preface with obſerving, that there ſeems to be wanting Tables and Methods ſimilar to theſe, whereby the Places of the Planets may be computed with the like Eaſe and Expedition; how much ſuch a Work may be acceptable a little Time will determine, when, as the ſame is already in Embrio, it may probably at a convenient Opportunity be brought forth.

TO THE
READER.

IN the PREFACE, Page 6. the mean Motion of the Sun is there ſpecified, as it relates to a ſingle Year only; but in Pages 101 and 162, as it reſpects 4000 Years, thereby creating the inconſiderable Difference of between two and three Thirds in Pages 110 and 167, which being ſo minute, there needs no Alteration.

According to the Note in the laſt Paragraph alſo Page 6. of the PREFACE, there is required ſo many times ten Thirds *(ferè)* as are the Nº of Days from the Firſt of *January* excluſive, to be added to the mean Longitudes of the Sun and Anomaly in the Tablatures, Pages 109 and 121. to make them agree with the Tables. See Pages 121 and 164.

When the Mean Anomaly of the Moon exceeds ſix Signs, you muſt enter the Table of the Reduction of the Mean, to the true Elliptic Equation thereof, with the Complement to twelve Signs, wherefore the Work beginning at the laſt Paragraph Page 131, and in Pages 132, 133, muſt be wrought with the Complement, *viz.* $0^{s} : 22^{\circ} : 34' : 4''$; when as the ſaid * Table is ſince computed to every deg. of Anomaly, by obſerving the Directions laid down in the ſaid Pages, you may obtain the required Reduction with little more Trouble than bare Inſpection, as in Pag. 162, ſee alſo Pag. 164,

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* See Page 12th of the Preface.

where the Complement of the Moon's mean Anomaly is 0s. : 22°. $\underbrace{30'.\ 36''}_{.51}$ and the prepared Deg. found as in Page 130, is 9°. $\underbrace{21'.55}_{.37}$, the .51 and .37 are the reſpective Decimals of the Vinculum'd Numbers under which they ſtand, then in the ſaid Table of Reduction, under 0s. 22°. the next leſs, and under 0s. 23°. the next greater, than the preſent mean Anomaly, and at the ſame time, againſt 8 in the Margin, the next leſs than the above prepared Deg. (*viz.* 9°. 37. decimally expreſt) you have reſpectively 23'. 49" and 24'. 52", their Difference is 1' : 3" or 63", which being multiplied by .51 the Decimal of the Exceſs of the preſent Mean Anomaly, above 0s. 22°. (the next leſs in the Table) gives 32" to be added to 23'. 49" (anſwering to the ſaid 0s. 22°.) which makes 24'. 21". Next the ſaid prepared Deg. (*viz.* 9. 37.) exceeds the Marginal Deg. enter'd againſt, *viz.* 8 by 1. 37. but againſt the Marginal Numbers 8° and 10°, and under 0s. 22°. or 0s. 23°. mean Anomaly, the Difference of the correſponding Numbers will be found to be 29". decreaſing, when it will be as 2 (which it is always) the Marginal Difference, is to 29" ſo is 1.37 (the Exceſs of the preſent prepared Deg. as above) to 19". 865, which 19". (though it might have been taken 20) as it is decreaſing, being ſubtracted from the afore-found 24'. 21" leaves 24'. 2" for the true Reduction, which as the Table directs, muſt be added to the Mean Elliptic Equation to give the true, ſee Page 162, and the laſt Paragraph, Page 138.

In Computing the Place of the Moon by the Theory according to the Modern Method, the ſeventh Equation is ever to be neglected, Sir *Iſaac* in his Second Edition of his *Principia*, taking no Notice thereof. Next for the other Equations, it will be beſt, firſt to compute the true Place of the Apoge, alſo the Diſtance of the Node the firſt time equated from the Sun. Then take the Sum or Ballance of the * Annual or Firſt, the † Second, Third, and Fourth Equations of the Moon, which let be applied as if it was the firſt Equation. The fourth Equation is in this Caſe to be thus obtain'd. Subtract the true Place of the Apoge from the collected Mean Longitude of the Moon for the Time requir'd, which will here give near enough her Mean Anomaly, from whence you may eſtimate alſo near enough the Elliptic Equation, which apply on a ſeparate Piece of Paper to the aforeſaid collected Mean Longitude of the Moon, next ſubtract the Sun's Place therefrom, alſo the Place of the Sun's Apoge from the true Place of the Moon's Apoge; theſe Numbers being order'd as in Page 127, you muſt enter the reſpective Table, p. 211, with this Caution, that the Numbers anſwering to the firſt ſix Signs, which are there made Ablative, muſt now be Additive, and to the latter ſix, which are Additive, muſt be made Ablative, when proceed as in Page 130, *&c.*

But this Method proves alſo Erroneous when that of the three Equations (as ſpecified in the PREFACE) with the Reduction to the Ecliptic is found to correſpond with Obſervations to a ſingle ſecond of Time, ſee the *Computus* at the End of the Book, which Obſervation was taken by *John Bevis*, M. D. at the Obſervatory of *Colin Campbell*,

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* See Pages 124, 125, 126, 127, 128, 129.

† The Increment to this Equation is to be taken out with the Diſtance of the Sun from the Moon.

bell, Eſq; at *Stoke-Newington*, the Moon being at the ſame time in the Quadrature.

If the Computation be made by the Theory, as firſt ſet forth, it will be 28 Seconds, and if by the modern Way, it will ſtill be 6 Seconds of Time defective.

Wherefore if Computations by the ſaid three Equations, as above, be made to a proper ſet of Obſervations, and the Differences regiſtred under the Mean Anomaly of the Moon, and againſt the Annual Argument (or Diſtance of the Apoge firſt Equated from the Sun) in like manner as in the Reduction of the Mean to the true Elliptic Equation, it ſeems very probable that a Method for obtaining with Certainty the Place of the Moon *à poſteriori* might thereby be ſettled.

Mar. 22. 1740, at 5 ho. 3′. 21″ P. M. Apparent Time the Appulſe of the Moon's Limb to the Meridian was obſerv'd by the above Gentleman at the ſame Place.

At which Time the Sun's true Place was	$0^{s}.\ 13^{\circ}.\ 14'\ 57''$
The Moon's (*viz.* Limb)	2 : 28. 9. 7
D° Lat.	1 : 50. 54 So. deſcend.

Alſo *Octob.* 27. 1740, at 15 ho. 51′. 2″ P. M. apparent Time (the Night of the Occultation of *Jupiter* by the Moon) the Appulſe of the Moon's Centre to the Meridian was obſerv'd at Mr. *Geo. Graham's*, in *Fleet-ſtreet*, *London*, by the aforeſaid Gentleman, likewiſe by Mr. *Short*.

At which Time the Sun's true Place was	$7^{s}:\ 16^{\circ}:\ 4'.\ 53''$
The Moon's d°.	3 : 10 : 23. 48
D° Lat.	24. 40 Nor. aſcend.

☞ The firſt of theſe two Obſervations, if computed by the Theory the old way, will be 15″, and by the modern 6″ defective, and the latter (the ☽ being nearly in the Octant) by either way will be 16″ alſo defective.

For the Eaſe of obtaining the Right Aſcenſion of the Moon, &c. with Latitude to compare with Obſervations, there are new Tables alſo added at the End of the Book, inſtead of thoſe in Pages 282 and 283, being for that Purpoſe more exact.

And here it is to be noted, that as the Meredian is ever the Nonageſime Deg. in Right Aſcenſions, the viſible Place of the Moon, as mention'd in Page 397, is of no moment, the obſerved and computed Right Aſcenſions, when on the Meredian, without regard to her viſible Place, being in this Caſe the ſame.

The two following Examples contain all that is neceſſary for clearing up the Uſes of the aforeſaid New Tables.

Let the true Right Aſcenſion of the Moon's weſtern Limb with Latitude for the Computus at the End of the Book, be ſought, the Longitude being there computed (♋) 3ˢ. 10°. 42′. 48″. and her Latitude 40′. 48″ South deſcending.

1°. Lat.
In the ſaid Table againſt 12°. next gr. Long. are 5′. 49
D° — — — 9 d° leſſer. — 4: 24

(which it is always) diff. 3 . . . diff. incr. 1: 25 (*viz.* 85″)

The difference between the Computed Longitude of the Moon and the next leſs in the Table is 1.° 42′.48″ this decimally expreſt 1.713.

When it will be as 3° the Tabular difference of Longitude is to 85″. ſo is 1.713 the difference between the next leſs Tabular and Computed Longitudes to 48″, which as the difference, *viz.* 85″ was increaſing, muſt be added to 4′. 24″. againſt ♋

9° Longitude in the Table, making 5′ 12″ for the Proſthaphereſis at the true Longitude, and 1° of Latitude. But the Computed Latitude is but 40′.48″. Wherefore it will be as 1° Latitude is to 5′.12″. (5.2) ſo is 40′.48″ (.68) to 3′.536. *viz.* 3′.32″. to be ſubtracted as the Table directs, from the Right Aſcenſion of the Point of the Ecliptic, anſwering to the Computed Longitude; which gives the true Right Aſcenſion with Latitude requir'd.

The Right Aſcenſion of the Point of the Ecliptic anſwering to the Computed Longitude 3^s : 10° :

42′ : 48″ *per* the Table, page 279. is found — —	101° : 39′ : 19″
Proſthaphereſis for Latitude 40′ 48″ So. to be deducted —	—3 .32
True Right Aſcenſ. with Lat.	101 : 35 : 47
Right Aſcenſion of the Sun 0^s : 14° : 15′ : 59″ *per* Tab. pag. 278 d^t.	13 : 7 : 31
Right Aſcenſion of the Time	88 : 28 : 16
which reduc'd to Time, as in page 314, gives —	5 ho : 53′ : 53″
To which adding 1″ for difference of Meredians between *Greenwich*, for which Place the Tables were all Computed, and *Stoke Newington*, the Place of Obſervation	1
gives — —	5 : 53 : 54

which is the Time of Obſervation to a ſingle Second.

Again, in the Example of *Aldebaran*, whoſe Longitude let be 2^s. or ♊ 5°. 57′ and Latitude South 5°. 29′. 49″. See *Hodgſon*'s *Curſus*, Vol. II. Pag. 420.

and who makes the Right Aſcenſion to be 65°. 2′ : 57″. which let be ſought by the Tables.

	next leſſer.	und. 5° Lat.	und. 6° Lat.
In the Table againſt ♊	3°. Long. are	1°:00′:18″	—1°:11′:59″
D° — — —	6 .d° next gr.	. 54. 21.	—1. 4. 52
	3		
Differences decreaſing		5:57	—:7:7
		357″	427″

When it will be as 3° the Tabular Difference of Longitude is to theſe Differences reſpectively, ſo is the Difference between the Leſſer Tabular Longitude, *Viz.* 3°, and the true Longitude 5° : 57′. (*Viz.* 2°. 57′) to the Number of Seconds reſpectively, to be ſubtracted as the ſame were decreaſing from the Numbers againſt ♊ 3° Longitude, and under 5° and 6° Latitude reſpectively, which gives the Proſthapherеſes in reſpect to the true Longitude : accordingly the Decimal of 2°. 57′ is 2.95, by which multiplying 357″ and 427″, and dividing the ſeveral Products by 3, or, which is more eaſy, multiplying 2.95 by one third of the ſaid Differences in Seconds reſpectively, *Viz.* 119″ and 142″.3 gives 351″. or 5′. 51″ in the firſt Place, and 420″. or 7′. in the ſecond, which being reſpectively ſubtracted, gives at the true Longitude.

under 5° Lat. under 6° Lat.

54′. 27 ——— and . . . 1°. 4′. 59″

Diff. 10′. 32″

or

632″ increaſing,

When as the above true Latitude of *Aldebaran* is ſo near 5½ degrees, half the ſaid Difference may be taken, *Viz.* 5′. 16″. the which (as the ſame was increaſing) being added to 54′ : 27″ at the true Longitude and 5° Latitude, gives 59′ : 43″.

the true Proſthapheresis requir'd Additive, anſwering alſo to the true Latitude.

The Right Aſcenſion of the Point of the Ecliptic, *Viz.* 2^{s} or ♊ 5°. 57′. found *per* Table, Page 278, is —— —— —— 64°. 3′ : 13

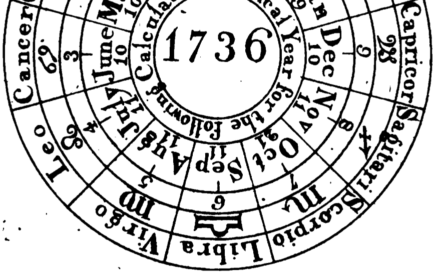
Proſthapheresis add —— 59 : 43

True Right Aſcenſion requir'd — 65 : 2 : 56

THE

The COMPENDIOUS ASTRONOMER.

THE *Young Arithmetician* may obſerve, that on the outermoſt Part of the following Figure are contain'd the Names of the Twelve Signs of the Zodiac; and under each Name, the Character and Number of the ſaid reſpective Sign; which Number ſhews how far, or



how many Signs each reſpective Sign is diſtant from the firſt Point of the Equinoctial Sign *Aries*; from which Point the Motions and Places of the Sun, Moon, *&c.* are always reckon'd and calculated, *viz.* from *Aries* to *Taurus* is one Sign, from *Taurus* to *Gemini*, two Signs, and ſo on; which is the Way the Sun, Moon, *&c.* always move. *Laſtly*, Under each reſpective Sign is the Month and Day, wherein the Sun enters the ſaid Sign.

EACH Sign is alſo divided into Thirty Parts, call'd *Degrees*, and each Degree into Sixty Parts, call'd *Minutes*; each Minute into Sixty Parts, call'd *Seconds*, and each Second into Sixty Parts, call'd *Thirds*, &c.

FROM this Diviſion of the Circle naturally follows this Notation, *viz.* That

				Thirds '''
60 Thirds	*are equal to*	1 Second	*thus characteriz'd*	''
60 Seconds		1 Minute		'
60 Minutes		1 Degree		°
30 Degrees		1 Sign		S. and
12 Signs (or 360 Deg.)		the whole Circle.		as in the *Figure*.

THEREFORE in Addition of theſe Quantities there is only to be obſerv'd the Common Rule, *viz.* How many of the Lower Denomination make One of the next Superiour? Which will be ſo many Units, to be carry'd to the next ſuperiour Place, *&c.*

EXAMPLE

EXAMPLE I.

S.	°	'	''	'''
2	17	44	36	53
1	28	32	25	41
3	17	19	14	12
1	19	59	58	57
9	23	36	15	43

In this Example the Thirds amount to 163, which are equal to Two Seconds and 43 Thirds; which ſaid 43 Thirds being ſet down under the reſpective Place, the Seconds, with the Two carry'd from the Thirds, are 135; which amount to Two Minutes and 15 Seconds; the ſaid 15 Seconds being ſet down, and the Two Minutes carry'd to its reſpective Place, make the Minutes amount to 156; which are equal to Two Degrees and 36 Minutes; the 36 Minutes being ſet down, and the Two Degrees carry'd to the next Place *viz.* of *Degrees*, make up the ſame 83, which are equal to Two Signs and 23 Degrees; which Degrees being ſet down, and the Two Signs carry'd to the next Place, *viz.* of *Signs*, make up their Number 9; and the whole Sum will be, as in the Example above. The like of all others, &c.

It many times happens in *Addition*, the Number, or Sum added up in the Place of Signs, exceeds 12, &c. in which Caſe, the 12, or ſo many times 12 as can be found in the ſaid Number, muſt be rejected, and the Remainder only ſet down.

EXAMPLE II.

S.	°	′	″	‴
6	19	20	30	50
9	16	49	57	59
3	28	59	49	3
8	5	10	17	52

THE Reaſon of Rejecting the 12 Signs, &c. is, as in the Hour-Hand of a Dial we only obſerve how far it is paſt the Hour of Twelve, or Point at Noon, without any regard to how many times it has made its Revolution; ſo in theſe Calculations regard is only to be had to how far the Sun, &c. is diſtant from the Equinoctial Point *Aries*, without any regard to the Number of Revolutions that in any time hath been made thereby.

EXAMPLE III.

	S.	°	′	″	‴
	11	0	13	17	16
	9	29	19	56	59
	10	17	14	13	12
	8	14	25	19	46
Sum	4	1	12	47	13

IN this laſt Example the *Sum* of the *Signs* is 40, which contains Three Revolutions, *viz.* 36 Signs, and 4 Signs over; which ſaid Four Signs are ſet down, and the 36 for the above Reaſon, are rejected: And theſe are all the Difficulties you will meet with in *Addition*.

SUB-

SUBTRACTION.

AS in *Subtraction* of other Quantities, ſo in theſe; where the Number of the lower Denominations to be ſubtracted cannot be immediately taken out of thoſe above, or over them, you muſt borrow one of the next ſuperiour Denomination, and add thereto, in your Mind, that Subtraction may be made, carrying the ſame on again, as you go, *&c.* which the following Example will clear up.

EXAMPLE I.

	S.	°	'	''	'''
From	4	3	24	13	20
Take	2	6	16	25	30
Rem.	1	27	7	47	50

Here 30 Thirds are greater than 20 Thirds, from which it ſhould be taken: Therefore you borrow One of the next ſuperiour Denomination, *viz.* one Second, or 60 Thirds; which, with the aforeſaid 20 Thirds, make 80 Thirds; from which, if you now take the ſaid 30 Thirds, the Difference will be 50 Thirds; which you ſet down, next the One that you borrow'd, and 25 Seconds, make 26 Seconds, which is to be taken from 13; but, for the aforeſaid reaſon, you muſt firſt borrow a Minute, or 60 Seconds from the next preceding Denomination, which will then be 73; from which taking the ſaid 26 Seconds, there remains 47 Seconds; which ſet down as before, and carrying the One you borrow'd, to 16 Minutes, it makes 17 Minutes, which is now to be taken from 24 Minutes, and there

remains 7 Minutes, which ſet down; next, 6 Degrees from 3 Degrees cannot be taken; therefore by borrowing a Sign, or 30 Degrees, one of the next ſuperiour Denomination, it will be 33 Degrees; from which taking the ſaid 6 Degrees, there remains 27 Degrees; which being ſet down, and the One carry'd to the two Signs, makes 3; which taken from 4, there remains One, as above, and the whole Remainder will be as in the *Example*, &c.

As before in *Addition*, the Circle, or Twelve Signs, &c. was rejected; ſo here in *Subtraction*, it may happen, that you may have occaſion to borrow the ſame.

EXAMPLE II.

SUPPOSE the Moon to be in the Firſt Point of *Gemini*, or Two Signs, and the Sun to be in the Firſt Point of *Aquarius*, or 10 Signs, and yo would know their Diſtance: Here the Sun wants Two Signs of the Circle, and the Moon is Two Signs beyond that Point (or 12 Signs;) ſo that they are Four Signs diſtant. Therefore, if to the Moon's Place, *viz.* 2 Signs, you add the Circle, *viz.* 12 Signs, and from that Sum 14, ſubtract 10 Signs, the Sun's Place, you'll have 4 Signs for their Diſtance, as before. Which gives this General Rule, That whenever *Subtraction* cannot otherwiſe be made, you muſt always take in the Circle, or Twelve Signs, &c.

EXAMPLE III.

From	3	25	24	32	23
Take	7	20	29	43	17
Rem.	8	4	54	49	6

As Decimal Fractions are of great uſe in the ollowing Calculations, I ſhall next exhibit the Maagement of them ſo far as concerns this Treatiſe, hich,by any one tolerably vers'd in *Arithmetic*,will e found full as eaſy as the Operations of *Integers* or Vhole Numbers: For Integers, or Whole Numers, according to Place, increaſe or decreaſe in a ecuple, or tenfold Proportion, *viz.* Any integral igit being mov'd a Place higher to the left hand, gnifies (or has a Value) ten times as much as it ad in the Place it poſſeſs'd before: And, on the ntrary, being mov'd a Place lower, to the right nd, it will ſignify, or have but one tenth Part the Value it had before.

* * *

NOTATION.

EXAMPLE I.

000 Ten thouſand, or 1000 multiply'd by 10.
000 A Thouſand, or 100 multiply'd by 10.
100 An Hundred, or 10 multiply'd by 10.
10 Ten, or Unity multiply'd by 10.
1 Unity, or One only.

FROM this Example 'tis obvious, beginning at the Place of Unity, that every aſcending Expreſſion, by the Addition of a Cypher, or Place to the right hand, ſignifies ten times as much as in the preceding ſtate. Therefore adding, or annexing to a Cypher (*viz* a Place) to the right hand of any Integral Expreſſion, is multiplying the ſame by Ten; two Cyphers, by an Hundred, &c.

FROM whence 'tis alſo plain, if you begin at the Head or uppermoſt Row of the Example, every ſubſequent Expreſſion is but a tenth Part of the preceding, which (as has been obſerv'd) is perform'd by ſeparating a Cypher, or Place to the right hand therefrom.

EXAMPLE II.

10000		Signifies, as above, *viz.* Ten thouſand.
1000	0	One tenth Part thereof.
100	00	One *Tenth* of the one 10*th*, or one 100th
10	000	One 10*th* thereof again, or one 1000th
1	0000	One 10*th* of *ditto*, or one *Ten thouſandth*

IN this Second Example every ſubſequent deſcending Expreſſion ſignifying but one tenth Par of what it did in the preceding State. Therefor the ſeparating a Cypher, or Place from any Integral Expreſſion to the right hand, is dividing th ſame by Ten; ſeparating two Cyphers, or tw Places, is dividing it by an Hundred, &c.

FROM theſe Examples 'tis evident, that the Operations in Integers are perform'd by a Decim Computation.

EXAMPLE III.

10001 Signifies Ten thouſand and one.
1000.1 *ditto* divided by 10
100.01 *ditto* —— 100 } (*or laſt divided by* 10)
10.001 *ditto* 1000 } *ditto.*
1.0001 *ditto* 10000 } *ditto.*

HERE, as in the laſt Example (where the Places ſo pointed off were all poſſeſs'd by Cyphers) every Expreſſion deſcending ſignifying but a tenth Part of what it did in the preceding ſtate; it follows, that Unity, the laſt Digit to the right hand in the firſt, or Integral ſtate, will in the Subſequent ſignify but a tenth Part thereof in the next Subſequent, but a tenth Part of what it did in the former, or an hundredth Part of what it did in the firſt; and ſo on.

THESE Places ſo pointed off, are call'd *Decimal Fractions*; and to diſtinguiſh them from Integers, they are always noted, and ſeparated therefrom by a Point, or Comma, plac'd before them to the left hand, as above.

CONSECTARY I.

BY this Example 'tis very eaſy always to diſcover the Diviſor, (which is alſo call'd the Denominator) to any of theſe Fractions: For when the Fraction conſiſts but of One Place, as in the firſt deſcending ſtep in the above Example, it is there, as you find, divided by Ten, *viz.* Unity, with One Cypher to the right hand thereof; in the next ſubſequent ſtate, where it conſiſts of Two Places, it is there divided by an Hundred, *viz.* Unity, with Two Cyphers to the right hand thereof, *&c.* Which gives this General Rule, *viz.* So many Places as the Fraction conſiſts of, ſo many Cyphers with Unity prefix'd to them (as in the Example) is ever the Diviſor, or Denominator to the ſaid Fraction.

CONSECTARY. II.

IT is alſo evident that prefixing a Cypher, or Place to any Decimal Expreſſion is, when pointed off, dividing tht ſame by 10, *&c.* (*Vide Firſt and Second State deſcending*, &c.)

CONSECTARY. III.

FROM theſe two laſt Obſervations 'tis obvious, that to divide any Integral Expreſſion by Unity with Cyphers to the right hand thereof (which is likewiſe to be Integral) you muſt point off ſo many Places to the right hand from the ſaid Integral Expreſſion to be divided, as are the Number of Cyphers following the ſaid Unit. And when the Number of Places in the aforeſaid Integral Expreſſion are leſs than the Number of Cyphers to the right hand of the ſaid Unit, you muſt prefix ſo many Cyphers thereto, as will make the Number of Places therein equal to the Number of Cyphers following the ſaid Unit: Conſequently, if the Expreſſion to be ſo divided, be a Decimal, only ſo many Cyphers as ſucceed the ſaid Unit, muſt be prefix'd to the ſaid Decimal Expreſſion, which when pointed off, will be the Decimal Expreſſion requir'd, *&c.*

CONSECTARY IV.

If to the laſt Decimal Expreſſion deſcending in the preſent Example, another Cypher was to be prefix'd, it preſuppoſes the ſaid Cypher to have exiſted immediately after the Unit to the left hand, in the firſt or Integral ſtate; or, which is the ſame thing, immediately after it, in the laſt, previous to its being pointed off. This is obvious from *Conſ.* 1. *viz.* the Diviſor's, or Denominator's conſiſting of ſo many Cyphers with the Unity prefix'd thereto, as are the Number of Places of any Decimal Expreſſion, &c.

CONSECTARY V.

As every Expreſſion deſcending is but a Tenth of the Preceding, by beginning at the lowermoſt Place in the preſent Example, 'tis plain, that every aſcending Expreſſion is ten times the Value of the next below it, *viz.* It is the *next* Lower multiply'd by 10, the next Aſcending is this laſt again multiply'd by 10, or the lowermoſt multiply'd by 100, &c. *viz.* It is the lowermoſt multiply'd by Unity, with ſo many Cyphers to the right hand thereof as are the Number of Gradations you aſcend. But by pointing off a Place to the left hand from the ſaid lowermoſt Expreſſion, it becomes the *next* Aſcending; by pointing off Two, it becomes the *next* Aſcending above that again, &c.

CONSECTARY VI.

THEREFORE To multiply any Decimal Expreſſion by Unity with Cyphers to the right hand thereof (Integral, as before) you muſt point off ſo many Places to the left hand therefrom, as are the Number of Cyphers following the ſaid Unit; which Places ſo pointed off, will poſſeſs the Integral Side of the *Example*: Therefore, if poſſeſs'd by any Digits, &c. they will be Integers; conſequently, when the Number of Cyphers following the ſaid Unit are equal to the Number of Places in the *Decimal Expreſſion* to be multiply'd thereby, the ſaid *Decimal Expreſſion* will become all Integral; and when they are more, the remaining Cyphers muſt, as in Example I. be annext to the right hand of the aforeſaid *Decimal Expreſſion*, which now, as in the laſt Caſe, will be likewiſe all Integral.

CONSECTARY VII.

It is obvious, that the Digits expreſſing theſe Fractions, have, beſide their own ſingle Value, as in Integrals, another, according to the Place they poſſeſs, *viz.* Unity in the firſt deſcending ſtate of the preſent Example, where it poſſeſſes the firſt Place, when pointed off to the right hand, ſignifies one tenth Part; in the next, where it poſſeſſes the ſecond Place to the right hand, it ſignifies one hundredth Part; in the next, or third Place, one thouſandth Part, &c Wherefore, if a Cypher or Cyphers follow the ſaid Unit to the right hand, the Value thereof will not be increas'd thereby: For while it poſſeſſes the ſame Place, it will ever expreſs or retain the ſame Value, the following Cyphers, *&c.* only ſignifying, that no Digits poſſeſs thoſe Places, *&c.* Theſe Places, beſides *Tenths*, *Hundredths*, *Thouſandths*, &c. are alſo call'd *Primes*, *Seconds*, *Thirds*, &c.

CONSECTARY VIII.

By comparing theſe Fractions with the Integrals to the left hand of 'em, as in the Second ſtate deſcending of the preſent Example Againſt 1000 Integral, you have .1 Decimal; in the next ſubſequent ſtate, you have 100 Integral, *viz* one tenth Part of the preceding 1000, and .01 Decimal, one Tenth alſo of the preceding .1, *&c.* Whence, as is alſo plain from the very *Nota- ion*, the ſame Law taking place in theſe Fractions, oth in Aſcending and Deſcending. As, in *Integrals*, t follows, That as *Ten*, or ſo many *Tens* as are in ny inferiour Place of *Integrals*, make an *Unit*, or ſo nany *Units*, in the next ſuperiour Place, *&c.* the ame muſt alſo follow true of theſe Fractions, *viz.* he Operations of *Addition* and *Subtraction*, and onſequently, *Multiplication* and *Diviſion*, will be he ſame as in *Integrals*, and only differ in Name, iz. *Integers*, or *Wholes*; *Decimals*, or *Parts*.

ADDITION of DECIMALS.

EXAMPLE I.

HERE I ſhall reſume the following Numbers from *Notation*, *Example* III. *viz.*

	Integrals.		*Decimals.*		*2d Operation.*
	1000		.1		.1000
	100		.01		.0100
	10		.001		.0010
	1		.0001		.0001
Sum	1111	*Sum*	.1111	*Sum*	.1111

THUS in the Integral Part, the Unit in th ſecond State deſcending, where it ſignifies an Hundred, is put under the Place of *Hundreds* in th uppermoſt State, before it can be added; as alſo in its proper Places in the other deſcending States So alſo the like Method is obſerv'd in the Decimal or Fractional Numbers, of placing like Places under like Places; which done, being added, as i Integrals, and the Number of Places in the Sum equal to the Number of Places in the greateſt Row of Decimals to be added, being pointed off to th right hand, give the true Sum, as above.

*Conſ. 7. AS *Cyphers to the right hand of any Decima Expreſſion do not increaſe the Value thereof, in th *Second Operation*, they are ſupply'd, till equal i Number of Places to thoſe in the greateſt Row to be added, which in the *Firſt Operation* was don Mentally.

LE

EXAMPLE II.

Let it be requir'd, to add into One Sum, the following Decimals, *viz.* 0342*+.12+007+00006, due regard being had to placing like Parts under like Parts, &c. It is not material which Row of Decimals is plac'd firſt.

[*] *This* + *Character is call'd* more, *and ſignifies, that the Number following it is to be added.*

Mentally.		*Supply'd.*
.005		.00006
.12		.03420
.00006		.12000
.0342		.00700
.16126	*Sum.*	.16126

As the Number of † Tens in any inferiour Place, are ſo many Units in the next Superiour, when in the Place of Tenths, or Primes, the ſame ſhall ſo happen, the ſaid Number of Tens will become ſo many Integers, &c.

† Ex. 3. Conſec. 8. *Notation.*

EXAMPLE III.

.4567	.98765
.7854	.39784
.6543	.99999
1.8964	2.88548

These laſt Sums are call'd *Mixt Numbers*, as conſiſting both of Integrals and Fractional Parts, in Addition of which they fall under the General Rule, of placing like Places under like Places: Then, to Add, as above, &c.

EX-

EXAMPLE IV.

7894.054	7894.05400
678.983	0678.98300
99.8	0099.80000
7.71256	0007.71256
Sum 8680.54956	*Sum* 8680.54956

* * *

SUBTRACTION *of* DECIMALS.

HERE, as in *Addition*, regard muſt be had t placing like Places under like Places: Nex proceed as in *Integrals*, pointing off ſo many Places to the right hand in the Remainder, as are the greateſt in Number, whether in the *Minuend* or *Subtrahend*.

EXAMPLES.

	(I.)			(II.)	
Minuend	.7321	From		.94327	From
Subtrahend	.5432	Take		.88158	Take
Remains	.1889		*Rem.*	.06169	

(III.)	(IV.)	(V.)
.23	102.786	34.56789
.17604	101.778	17.5
.05396	1.008	17.06789

In the *Third Example*, where the Number of Places in the *Minuend* are leſs than in the *Subtrahend*, there Cyphers, as in *Addition*, are Mentally ſuppos'd. In the *Fifth Example*, the like is to be underſtood in the *Subtrahend*, &c.

MULTIPLICATION *of* DECIMALS.

Multiplication here, as in Integrals, is the Addition of many Equals; the Rules of which will be beſt clear'd up by *Examples*.

EXAMPLE I.

CASE I.

Let it be requir'd, to Multiply 4, an Integer, by .5, a Decimal. Here .5, the *Multiplier*, is 5, divided by 10, as is plain from the foregoing *Notation*. Therefore the Product of 4 by .5 muſt alſo be divided by 10; which is done, by * pointing off one Place of the ſaid Product to the right hand; which being poſſeſs'd by a Cypher, the Product will therefore be 2.

* Ex. 2. Conſ. 1. *Notation.*

4 *Multiplicand.*
.5 *Multiplier.*

2.0 *Product.*

CASE II.

Again, As *Multiplication* is only the Addition of Equals, and in *Multiplication* it matters not which Factor is made the * *Multiplier*; let the aforeſaid .5 be added up four times together, which makes twenty Tenths: But the Number of † Tens in the Place of Tenths becomes Integral; which here being Two, the Sum is therefore 2.0, equal to the above Product.

* *Euclid, lib.* 7. Prob. 16.
† Ex, 3. Conſ. 8. *Notat.*

Operation.

.5
.5
.5
.5

Sum 2.0 *Equal to the above Product.*

CASE III.

Laſtly, In the preſent Example, the *Multiplier*, viz. .5, or 5 divided by 10, ſignifies, that 5 tenth Parts of 4, the *Multiplicand*, is to be taken. If therefore the ſaid *Multiplicand*, viz. 4, be divided by 10, the *Denominator* of the *Multiplier*, which is perform'd by † pointing it, *&c.* and the ſame be now multiply'd by 5 Integral, as the Queſtion imports, you will likewiſe have the true Product.

† Ex. 3. *Notat* Conſ. 3.

.4 *Multiplicand.*
5 *Multiplier.*

2.0 *Product*, &c. as *per Caſe* 2.

EXAMPLE

EXAMPLE II.

Let it be requir'd, to multiply 234, Integral, by .23, Decimal.

Here, by the laſt *Caſe*, the Import of the Queſtion is, that 23 hundredth Parts of 234, the *Multiplicand*, are to be taken: Wherefore, according to the ſaid Rule, if the *Multiplicand* be divided by 100, the *Denominator* of the *Multiplier*, &c. it will be * 2.34, which now is to be added up 23 times together (that is the ſame as being multiply'd by 23;) but as in *Addition* there muſt be ſo many Places pointed off, as are in the greateſt Row of the *Factors* to be added; which here, are only Two, and equal in every *Factor*, &c. Therefore there will be but Two Places to be pointed off in the ſaid Sum; or, which is the ſame, from the *Product* made by the Multiplication of the above Numbers, equal to the Number of Places at firſt in the ſaid *Multiplier*; which gives this Rule, *viz.* When an Integral Number is to be multiply'd by a Decimal; and the contrary, when a Decimal is to be multiply'd by an Integral, you muſt point off ſo many Places in the *Product*, as are in the *Decimal Fraction* ſo Multiplying, or Multiply'd.

* Ex. 3. *Notation*, Conſ. 3.

EXAMPLE III.

Let it be requir'd to multiply 12 *Integral*, by .005 *Decimal*.

* Ex. 1. Caſe 3.
† *Notat.* Ex. 3.
Conſ. 1, 3.
|| Ex. 2.

HERE the *Multiplicand* being divided by the * *Denominator* of the *Decimal Multiplier*, viz. .1000; it becomes † .012; which now is to be multiply'd by 5, Integral, and the *Product* will conſiſt of || three Decimal Places. (*Vide* the *following Operations.*)

† Ex. 1. Caſe 2.

Operation 1.	*Operation* 2.	*Operation* 3.
12	.012	.005
.005	5	12 †
60	.060	.060

* Ex. 1. Caſe 1.
† *Notat.* Ex. 3.
Conſ. 3.

THE *Product* in the Firſt Operation, which is perform'd according to the common Method, conſiſts of a Place leſs than in the other Operations, which are the True; but the *Product* in the Firſt Operation is the *Multiplicand*, 12 into 5, an Integral; which is but really 5 divided by 1000, as above: Therefore the *Product*, which is now an Integral, muſt be divided by * 1000; which will thereby become † the true *Product*, as in the other Operations.

WHICH gives this Rule, *viz.* When any Integral is to be multiply'd by a Decimal, or Decimal by an Integral, and the Number of Places in the *Product* are leſs than the ſaid Decimal Places, you muſt prefix ſo many Cyphers to the ſaid *Product* as will make them Equal.

EXAMPLE IV.

LET it be requir'd to multiply .16, a Decimal, y .9, a Decimal.

Operation 1.	*Operation* 2.
.16	.016 +, &c.
9	9
.144	.144

FROM this Example, 'tis demonſtrably ſeen, hat in multiplying a Decimal by a Decimal, ſo nany Places muſt be pointed off in the *Product* for ecimals, as are the Number of Decimal Places, oth in the *Multiplicand* and *Multiplier*.

EXAMPLE V.

LET it be requir'd to multiply .12 Decimal by 2 Decimal.

Operation 1.	*Operation* 2.
.12	.0012 *
.12	12
.144	.0144 *true Product.*

* Ex. 3. Caſe 3, *&c.*

FROM this Example, 'tis likewiſe demonſtrably vident, that when the Number of Places in the *roduct* are leſs than the Decimal Places, both in he *Multiplicand* and the *Multiplier*; you muſt, as *Example* 3, prefix Cyphers thereto, till made qual; which pointed off, will be the true *Product* quir'd.

EXAMPLE VI.

LET it be requir'd, to multiply 24.3 (which i call'd a *Mix'd Number*, as conſiſting both of Integral and Decimal Places) by 2.43, alſo a Mix Number.

HERE 2.43, the *Multiplier*, is 243 Integral divided by * 100. Therefore 243 hundredth Part of 24.3, are only to be taken.

* *Notat.* Ex. 3. Conſ. 1, 3.

NEXT, If the † *Multiplicand* be divided b 100, the *Denominator* of the *Multiplier*, that th ſame may be us'd Integrally, there muſt two mor Places for Decimals (‖ by prefixing Cyphers, i requiſite) be pointed off, to that already in th *Multiplicand*. Wherefore the *Product* will conſiſt of * three Decimal Places; but the two Plac thus pointed off in the *Multiplicand*, are equal t thoſe before in the *Multiplier*; which, as is evident, will always be the Caſe in other Multiplications, &c.

† Ex. 1. Caſe 3.

‖ *Notat.* Ex. 3. Conſ. 3.

* Ex. 2.

FROM whence flows this General Rule in a Caſes, *viz.*

MULTIPLY, as if all were Integrals; an from the *Product* point off ſo many Places fo Decimals, as are the Decimal Places, both in th *Multiplicand* and *Multiplier*; and when the Number of Places in the *Product* are leſs than the Plac in the *Multiplicand* and *Multiplier*, you muſt prefix Cyphers thereto, till they become equal; whic when pointed off, will be the true *Product* r quir'd.

Operation 1.	*Operation* 2.
24.3	.243
2.43	243
729	729
972	972
486	486
59.049	59.049

EXAMPLE VII.

LET it be requir'd, to multiply 23.456 by 3.456.

Operation 1.	*Operation* 2.	
23.456	.023456	Ex. 1.
23.456	23456	Caſe 3.
140736	140736 *	
117280.	1.17280 . *	
93824..	9.3824 . . *	
70368...	70.368 . . . *	
46912....	469.12 . . . . *	
550.183936	550.183936	

* Ex. 2.

IN the Second Operation, the *Multiplicand* nſiſts of Six Decimal Places; which being added o ſo many times to its ſelf, as the *Multiplier* hich is now Integral) expreſſes, the Sum (which alſo the *Product*) will likewiſe conſiſt of Six Decimal Places (*per* Example 2. and *Addition*) e al to thoſe, according to the Rule in the Firſt *eration*, &c.

Of

Of CONTRACTION *in* Multiplication *of* DECIMALS.

IN Multiplication, when in the *Multiplicand* an *Multiplier* there are many Decimal Places, th *Product*, which always conſiſts of as many Decima Places, at leaſt, as are in both, will thereby be ver numerous, when two or three ſuch Places, &c. ar moſtly ſufficient for the Purpoſe; in order therefore to abbreviate ſuch Operations, obſerve the following Rule.

PLACE the Unit's Place of the *Multiplier* (i the ſame is poſſeſs'd by a Cypher, 'tis the ſam thing) under that Place of Decimals in the *Multiplicand*, as you would have the Number of Decima Places in the *Product* to conſiſt of, *viz.* under th ſecond or third Decimal Place in the *Multiplican* when you would have two or three Decimal Place in the *Product*, &c.

NEXT, If there are any Integers to the le hand of the ſaid Unit's Place, they muſt all be inverted to the right hand thereof, and the Decima before, to the right hand of the ſame, muſt all b inverted to the left hand.

IF the Places of the Integral Part, when thi inverted, fall below (to the right hand) the Plac of the *Multiplicand*, you muſt annex Cyphers t the right hand of the *Multiplicand*, till they becom equal to the ſaid Places of the Integral Part.

TH

THEN begin, as in the common Way of Multiplication, with the laſt Digit to the right hand; and by it multiply the Digit directly over it (if any poſſeſſes that Place, &c.) having a mental regard to what would be carry'd by the Multiplication alſo of the Digits to the right hand thereof; which being added to the aforeſaid *Product*, ſet down the ſame directly under the ſaid multiplying Digit; proceeding on multiplying the reſt of the Digits to the left hand in the *Multiplicand*, as in other Multiplications.

OBSERVE the ſame Rule with the next Digit in the *Multiplier*; ſetting nothing down, but from the Multiplication of the Digit directly over it; which then muſt be ſet down directly under the laſt Place to the right hand of the aforeſaid firſt *Product*, and ſo on, as before. Proceed in like manner with all the other Digits in the *Multiplier*; when finiſh'd, the Number of Places of Decimals in the *Multiplicand*, unto which the Unit's Place of the *Multiplier* was ſo plac'd incluſive, being pointed off from the Sum of thoſe ſeveral *Products*, gives the true Product requir'd.

EXAMPLE VII.

LET it be requir'd, to multiply 23.456 by 23.456, the laſt Example, ſo that there may be only Two and Four Places of Decimals in the *Product*, which otherwiſe, by the Rule, would be Six.

23.456	23.45600
65432	65432
46912	4691200
7037	703680
938	93824
117	11728
14	1407
550.18	550.1839

AS the Reaſon of this Rule is not altogeth clear, from comparing theſe Examples with tho wrought at large, in the laſt Example, I ſhall exhibit a Demonſtration thereof.

ALTHO' in Multiplication of Integrals it be a receiv'd Rule, always to begin at the Unit's Plac in the *Multiplier*; yet it is not neceſſarily ſo: Fo you may likewiſe begin at the laſt Place to the le hand. [*Vide* the *following Example.*]

EX

EXAMPLE VIII.

LET it be requir'd, to multiply 243, Integral, by 243, Integral.

Operation 1.	Operation 2.
243	24300
243	342
486..	48600
972.	9720
729	729
59049	59049

IN the Firſt Operation, the Multiplication is beun with the laſt Place (which is the higheſt) to he left hand; but the 2 there is 200; therefore here are two Cyphers ſuppos'd to the right hand f the *Product* made thereby, *&c.* and is the Reerſe of the cuſtomary Method.

IN the Second Operation, the *Multiplier* is ere inverted, and the two Cyphers added to the *Iultiplicand*, is * multiplying the ſame by 100; hich being alſo multiply'd by 2, gives the ſame; iultiply'd by 200, as in the firſt Operation, next erating with the 4, and beginning at the Place rectly over it, which is the firſt *Multiplicand*, ultiply'd by † 10, and this again by 4, is the me as in the Firſt multiply'd by 40, &c. which arly demonſtrates the former Rule, as to the tegral Part.

* *Notation*, Ex. 3. Coniec. 3.

† *Ibid.*

Next, To demonſtrate the Fractional Part of the Rule, I ſhall reſume the laſt Example, as follows, where the *Product* is to conſiſt of Two Decimal Places.

EXAMPLE IX.

Operation 1.	*Operation* 2.
23.456	23.456
23.456	65432
469.12	469.12
70.368	70.37
9.3824	9.38
1.17280	1.17
.140736	.14
550.183936	550.18

In the Firſt Operation, which is perform'd according to Example 8. the higheſt Digit to the left hand, *viz.* 2, is really 20. The Multiplicand therefore being multiply'd by 10, and tha Product again by 2, gives the firſt Product; bu the ſaid Multiplicand is multiply'd by 10, b

* *Notat.* * pointing off to the left hand 4 (which is he
Ex 3. done mentally) the Digit that poſſeſſes the Plac
Conſ. 6. of *Primes* in the Decimal Part of the ſaid Multiplicand; conſequently, the ſaid firſt Product wi
† Ex. 2. conſiſt but of two † Decimal Places, to which th inverted Rule alſo correſponds.

Next, As *per* the Queſtion, the Product is conſiſt but of Two Decimal Places in the whol therefore in multiplying by the other Digits, in the firſt Operation, all the Places deſcending to the right hand, below the two ſaid Decimal Places in the firſt *Product*, might have been omitted, as in the inverted Operation.

In both theſe Operations, the Multiplier is really conſider'd Integrally, *viz.*

The two firſt Products, in the Firſt Operation, are made by 23, the Integral Part of the Multiplier; next that, .4, in the place of *Primes*, of the ſaid Multiplier, may alſo be us'd Integrally *; 3, the Integral Digit, in the Unit's Place of the Multiplicand, muſt be pointed off (*viz.* here, mentally) to the right hand in the ſaid Multiplicand, which will thereby conſiſt of Four Decimal Places; and ſo many ſuch Places does this *Product* alſo abſolutely poſſeſs; beyond which, to the left hand, it will be Integral: The like is to be conſider'd of the ſeveral other Products.

* Ex. 1. Caſe 3.

But, as in the reſult of all theſe Products, there are only two Decimal Places to be concerned; therefore no notice is to be taken at any time (but only of the Carriage by ſuch Multiplication) of what ariſes from the Multiplication of the Digits below the two leading Decimal Places in the ſaid Multiplicand, of which, the Place laſt mentally pointed off, is always the firſt leading Place. In the preſent Caſe, 3, the firſt Integral Digit, being thus pointed off, that .4, the Multiplying Digit, may be us'd Integrally, the two leading Decimal Places will then be .34; under which laſt place, the multiplying Digit 4, in the inverted Operation directly falls; with which proceeding according to the Rule, taking in at the ſame time the Carriage (which is almoſt done by Inſpection) that ariſes from the Multiplication of the Digits to the right hand of the ſaid two leading Places in the Multiplicand, gives the *Product* requir'd, as in the ſaid inverted Operation.

* Ex. 1. Caſe 3.

THAT the Digit 5 in the Multiplier may alſo be us'd * Integrally, the next Integral, 2, in the Multiplicand, is now mentally to be pointed off to the aforeſaid 3; and, for the aforeſaid Reaſon, no Decimal Places to be taken notice of for the *Product*, till you come to 3, in the ſaid Multiplicand; under which, 5, the multiplying Digit in the inverted Operation, by being ſo inverted, directly falls.

† *Notat.* Ex. 3. Conſ. 3

THAT 6, the next multiplying Digit, may likewiſe be us'd Integrally, there is requir'd another Integral Place in the Multiplicand, to be pointed off; which Multiplicand conſiſting of no more, a † Cypher muſt therefore be mentally prefix'd, and no Decimal Places taken notice of for the *Product*, till you come to 2, in the ſaid Multiplicand; under which, 6, the ſaid multiplying Digit, in the inverted Operation, directly falls.

THUS, As each inverted Place to the left hand, in the Multiplier, requires an Integral Place in the Multiplicand, to be pointed off to the right hand, for a Decimal, it is evident, by always beginning at the Place in the Multiplicand, directly over the multiplying Digit, that the ſame Number of Decimal Places for the *Product*, as at firſt deſign'd by the Unit's Place, will thereby be ſtill kept up; which fully demonſtrates the ſaid Rule.

In the Firſt Operation, all the Decimal Places o conſider'd, are ſet down at large in each Product; which compar'd with the inverted Rule, erves as a further Illuſtration thereof.

When in the Carriage from the other Places of the Multiplicand, below the leading Decimal Places, &c. the Remainder ſhall happen to exceed 5, &c. there, generally, is ſubſtituted an Unit in the next ſuperiour Place, for it; when under, 'tis neglected; as, in the foregoing inverted Operation, multiplying by 3, *viz.* 3 times 6 (the Digit in the Multiplicand, to the right hand of that, directly over the ſaid 3) is 18, *i. e.* 8, and One to be carry'd forward; next, 3 times .5, and the Unit to be carry'd forward, make 16; but ſeeing the 8, which before remain'd, is conſiderably above 5, the ſaid 16 is therefore made 17, (as *per* Example, &c.)

This carefully obſerv'd, as alſo to abate for ſuch Subſtitutions, in the ſucceeding Multiplications, as occaſion requires, you will ſeldom fail to be exact.

EXAMPLE X.

LET it be requir'd, to multiply 467.5 by .243, ſo that there may be One and Three Decima Places in the *Product*.

Operation 1.	*Operation* 2.
467.5	467.5..
342.0	342.0
935	93500
187	18700
14	1402
113.6	113.602

IN both theſe Operations, the Place of Uni is poſſeſs'd by a Cypher; which being plac'd a cording to the Rule, as above, &c. gives the Pr ducts, as requir'd.

THE ſame wrought at large, &c.

467.5
..243

14025
18700
9350

113.6025

DIVISI

DIVISION *of* DECIMALS.

DIVISION of *DECIMALS*, as in *Integrals*, is the taking or ſubtracting of one or more Equals from any Number; and is therefore, in all reſpects, the juſt Contrary to *Multiplication*.

EXAMPLE I.

LET it be requir'd to divide an Integral Number by a Decimal Fraction only, *viz.* Unity, an Integral, by Unity, a Decimal, one Tenth, or a Prime.

HERE the Queſtion imports, How many times is .1, or one Tenth, contain'd in Unity, Integral, or One; or how many times may one Tenth of of an Unit be taken from, or out of the ſaid Unit? It is evident, that it may be taken away ten times; as alſo, that it is contain'd ten times therein: Wherefore the Quotient will be 10, *viz.* ten times as much, as if the ſaid Integral Unit had been divided by another Integral Unit, which is very plain.

THEREFORE, after the Diviſion is ended, there is requir'd, to add a Cypher to the right hand of Unity, the Quotient (* which is increaſing the ſame ten times) in order to obtain the true Quotient.

* *Notat.* Ex. 3. * Conſ. 6.

OPERATION I.

.1) 1 (10 *true Quotient.*

OR, which comes to the ſame thing, if the ſaid Cypher be annex'd to the Dividend, *viz.* to the right hand thereof, which is increaſing it ten times the Value, as before, and next dividing, as if both were Integrals, the Quote will be the true Anſwer requir'd.

OPERATION II.

Diviſor. Div^d. Quotient.
1) 10 (10

THE Demonſtration hereof, as alſo the other Rules in *Diviſion*, are from *Euclid, lib.* 7. Prop. 17, *viz.*

IF Two Numbers are multiply'd by any Number, the Products made thereby, will have the ſame *Ratio*, as the Numbers had to each other, before they were ſo multiply'd.

THE Converſe of which is evident, *viz.*

IF Two Numbers are divided by any Number, the Quotients will have the ſame *Ratio,* to each other, as the ſaid Two Numbers had, before they were ſo divided.

BUT the *Ratio* of Two Numbers is ever expreſs'd by their Quotients :

THEREFORE, the Quotients of the Numbers under the aforeſaid Circumſtances, will always be equal.

IN the preſent Example, multiplying the Diviſor by 10, it becomes Unity, * Integral; and that the ſaid *Ratio* may ſtill ſubſiſt, the Dividend muſt alſo be multiply'd by † 10, which will be as in the *Second Operation*, &c.

* *Notat.* Ex. 3. Conſ. 6.

† *Euclid. lib.* 7. Prop. 17.

EXAMPLE II.

LET it be requir'd, to divide 1, Integral, by .01, a Decimal.

HERE, to make the Diviſor Integral, it muſt be multiply'd by * 100; and that the ſame *Ratio* may likewiſe ſtill ſubſiſt, the Dividend muſt alſo be multiply'd by 100; and the Quotient will be, as in the following Operation.

* *Notat.* Ex. 3. Conſ. 6.

Diviſor. *Div*^{d}. *Quotient.*
1) (100 (100

Which gives this Rule, *viz.*

TO divide an Integral Number by a Decimal, add ſo many Cyphers to the Dividend, as the Decimal Diviſor contains Places, and divide as in Integrals; and the Quotient will be ſo far the true Anſwer, in Integrals.

EXAMPLE III.

LET it be requir'd, to divide .484, a Decimal by 4, an Integer.

AS before, the Diviſor, ſo here, the Dividend is now to be made Integral; which is, multiplying it by † 1000. Next, to preſerve the ſame *Ratio*, the Diviſor muſt alſo be multiply'd by 1000. If theſe two Products, *viz.* 4000 and 484, be

† *Notat.* Ex. 3. Conſ. 6.

be divided by 4, the ſignificant Digit in the Diviſor, the Numbers produc'd thereby, will be 1000, and 121; which, by the Converſe Rule, have likewiſe the ſame *Ratio*. *Laſtly*, The ſaid 121 being divided by 1000, gives † .121, Decimals, the true Quotient, *&c.* which are equal to the Number of Decimal Places at firſt in the Dividend.

† *Notat.* Ex. 3. Conſ. 3.

EXAMPLE IV.

Let it be requir'd, to divide the ſaid .484, Decimal, by 44, Integral.

By the Foregoing, the Diviſor and Dividend will become 44000, and 484, Integral; both which being divided by 44, the ſignificant Digits in the Diviſor, gives 1000, and 11; which ſaid 11, being divided by 1000, gives * .011, the true Quotient requir'd.

* *Notat.* Ex. 3. Conſ. 3.

From theſe Two laſt Examples flows this Rule, *viz.* In dividing a Decimal by an Integral Number, divide as if all were Integrals: Next, point off ſo many Places in the Quotient, for Decimals, as are the Decimal Places in the Dividend; and when the Digits, or Places in the Quotient ſhall be found deficient, you muſt prefix Cyphers thereto, till made equal.

EXAMPLE V.

Let it be requir'd, to divide .1, a Decimal, by 16, an Integral.

IN this Example, the Dividend being made ntegral, the Diviſor will become preſerving the ame *Ratio* 160; the ſignificant Digits of which Diviſor, *viz.* 16, will not go in 1, the now Dividend; but by adding an equal Number of Cyphers, to the right hand of both (as ſhall be found onvenient) that the ſame *Ratio* may ſtill ſubſiſt (which is, multiplying them by 10, 100, &c.) and hen dividing by the ſignificant Digits of the ſaid Diviſor, as in the former Examples, you will have he true Quotient requir'd. [*Vide* the *following States.*]

```
          State 1.        State 2.
        16 ) .1 (      160 ) 1 (

               State 3.
   (16       (16
   1600000) 10000 (625
               96
              ---
               40
               32
              ---
                80
               (0)
        100000) 625(.00625 true Quitient *.
```

* Notat. Ex. 3. Conſ. 3.

OR, if Cyphers, as found convenient, had been annext to the right hand of the Dividend .1, viz. .10000 (which are ſo many Decimal Places, ho' not poſſeſs'd by Digits) and the ſame divided by 16, the firſt Diviſor, the Quotient 625, according to the Rule, muſt have two Cypbers preix'd thereto, to make the Places therein for Decimals, equal to thoſe in the Dividend; which being pointed off, gives the true Quote, as before.

Of

Of MIX'D NHMBERS.

EXAMPLE VI.

LET it be requir'd, to divide 49948.5, b 23.45.

THIS Example, ſtated *per Example* II. a under, *viz.* the Diviſor made Integral, &c. ſhews that when in the Diviſor the Decimal Places ar more than in the Dividend, you muſt alſo anne Cyphers to the right hand of the ſaid Dividend, till made equal *, when dividing, as in Integrals, the Quotient will ſo far be Integral.

* *Vide* Example 1. of this.

State 1.

23.45) 49948.5 (

State 2.

2345) 4994850 (2130
3048
7035
(0000).

EXAMPLE VII.

State 1.

234.5) 49.9485 (

State 2.

2345) 499.485 (.213
3048
7035
(0000)

In this Example, (*State* 1.) where the De-
imal Places in the Dividend are more than in
he Diviſor, there are (*State* 2.) ſo many Deci-
nal Places pointed off to the left hand, from
he ſaid Dividend, as were equal to thoſe in the
aid Diviſor. By which means, the ſaid Diviſor
and Dividend ſo far) become Integral †. Three,
he remaining Decimal Places, in the ſaid Divi-
lend, by *Example* III. of this, ſhews, that ſo
nany Decimal Places muſt be in the Quotient, &c.
Which gives this General Rule in all Caſes, *viz.*

† *Notat.* Exam. 3. Conſ. 6.

Divide, as if all were Integrals *, annexing
yphers to the right hand of the Dividend, at
leaſure, or, as occaſion requires; next, pointing
ff ſo many Places for Decimals, in the Quoti-
nt, as will make them in the Diviſor equal to
hoſe in the Dividend; gives the true Quotient
equir'd; regarding at the ſame time, (*perRule*, to
x. 4, of this) that when the Places in the Quo-
ient are deficient, to prefix Cyphers thereto, till
nade equal.

* *Per* Ex. 5. of this.

EX-

EXAMPLE VIII.

234.5) 4.99485 (.0213
3048
7035
(....)

THIS laſt General Rule being carefully obſerv'd, it will be very eaſy (and is ever neceſſary, before you proceed in your Diviſion) t eſtabliſh the Value of the Firſt Digit of the Quotient; after which, the Values of the following appear by Inſpection.

THERE is another excellent Method of diſcovering the Value of the Firſt Digit of th Quotient, *viz.*

OBSERVE, in the Product made by the Firſt Digit of the Quotient and Diviſor, under wha Place of the Dividend the Unit's Place (tho poſſeſs'd by a Cypher) in the ſaid Product falls: For of the ſame Value in place with tha of the Dividend, will the Firſt Digit of th Quotient ever be.

EXAMPL

EXAMPLE I.

LET the Numbers be, as in the Fifth Example.

Operation 1.	*Operation* 2.
16).10000 (625	16 (.10000 (.00625
96	96
——	——
40	40
80	80
(0)	(0)

HERE 6, in the Place of Units, of the Product, &c. falls under the Place of Thirds in the Dividend; and proceeding on in the Diviſion, as every ſucceeding Place in the Dividend, gives another Place in the Quotient; it follows, that the Number of Places in the Quotient will be equal to thoſe in the Dividend, from the aforeſaid Place of Thirds incluſive; as, in the Firſt Operation: But by *Example* 4, (of this) if the Number of Places in the Quotient are not equal to thoſe in the Dividend, they muſt be made ſo, by prefixing Cyphers; which, as is plain, from the Second Operation, will always be equal to the remaining Decimal Places to the left hand in the Dividend, from whence the Place of Units in the ſaid Product falls; and conſequently, the Value in Place of the firſt Digit of the Quotient will ever be the ſame with that of the Dividend, under which the Unit's Place in the ſaid Product ſo falls.

To clear this up in *Mix'd Numbers*, take the following Example.

EXAMPLE II.

Operation 1.	*Operation* 2.
12.5) .1 000 (8	125) 1.000 (.008
100.0	1000
(0)	(0)

In the Firſt Operation, the Place of Units in the Product, *&c.* which is poſſeſs'd by a Cypher, falls under the Place of Thirds in the Dividend, and conſequently, 8, the firſt Digit, in the Quote, will be of the ſame Value and Place, and muſt therefore have two Cyphers prefix'd thereto, and is conſonant to the laſt General Rule, and which in the Second Operation, where the Diviſor is made Integral, *&c.* is evidently clear'd up.

This Rule alſo takes place in Integers, or Whole Numbers, as will be evident, from One Example, *viz.*

25) 1000 (40
100
(0)

Here the Unit's Place of the Product, *&c.* falls under the Place of Tens in the Integral Dividend; the firſt Digit of the Quotient will therefore be Tens, *viz.* 4 Tens, or 40, &c.

Of Reduction *of* VULGAR FRACTIONS *to* DECIMALS.

ALL Fractions, but Decimals, are call'd *Vulgar*, and admit the Unit, &c. to be divided into any Number of Parts; as, 4, 8, 16, &c. and are expreſs'd, as follows.

$$\frac{1 \text{ call'd the } \textit{Numerator},}{4 \; \textit{ditto}, \textit{Denominator},} \qquad \frac{1}{8} \text{ and } \frac{1}{16}, \&c.$$

THE *Numerator* is the Number to be divided, ınd the *Denominator* is the Diviſor, and expreſſes he Number of Parts the Numerator is to be diided into.

IF the Numerators and Denominators of theſe ractions be likewiſe multiply'd by one and the ame Number, the new Numerators and Denoninators will ſtill retain the ſame *Ratio* (*Euclid*, *ib*. 7. Prop. 17.)

SUPPOSE, the above Fractions be thus muliply'd by by 2, they will then become $\frac{2}{8}$, $\frac{2}{16}$, $\frac{2}{32}$.

HERE, as $\frac{1}{4}$ and $\frac{2}{8}$ keep ſtill the ſame *Ratio*, ie Quotient of 1 divided by 4, will be equal to iat of $\frac{2}{8}$, and conſequently, the Value of the ractions $\frac{1}{4}$ and $\frac{2}{8}$ will be equal. The like of all hers.

THEREFORE to reduce a Vulgar Fraction to a Decimal; let both the Numerator and Denominator of the ſame be multiply'd by Unity with Cyphers, &c.

NEXT, divide both theſe Products by the ſignificant Digits of the Denominator, and theſe again, as in the Third and Fourth Examples of *Diviſion*, and you'll have the Decimal Fractions requir'd.

EXAMPLE I.

LET it be requir'd, to reduce $\frac{1}{4}$ to a Decimal Fraction.

$$\begin{array}{lll})\,4 & \underline{100} & (\,\underline{25} \\ )\,4 & 400 & (100 \end{array}$$

or ·25, *Decim. Fraction* requir'd

OR, by the Fifth Example of *Diviſion*, by adding a convenient Number of Cyphers, as ſo many Decimal Places, to the Numerator, and dividing by the Denominator, you will alſo have the Decimal Fraction requir'd.

EXAMPLE II.

LET it be requir'd, to reduce $\frac{1}{16}$ to a Decimal Fraction.

16) 1.00 (.0625 *Decimal Fraction* requir'd.
40
80
(0)

IN this Example, when the Value of the Firſt Digit of the Quote was eſtabliſh'd, a Cypher was added to each Remainder, *&c.* The like of all others.

IN *Reduction* of *Vulgar Fractions* to *Decimals*, if the Numerator be a ſingle Digit, and the Denominator 9, the ſaid Digit will continually repeat in the Quotient.

EXAMPLE III.

LET it be requir'd, to reduce $\frac{2}{9}$ and $\frac{5}{9}$ to their Equivalent in Decimal Expreſſions.

Operation 1.
9) 2.000 (.222, &c.

Operation 2.
9) 5.000 (.555, &c.

THIS is obvious, from the very *Notation of Numbers*: For in the Firſt Operation, 2 is multiply'd by 10, which is equal to 10, multiply'd by 2, (*Euclid, lib.* 7. *Prop.* 16.) which Product is now to be divided by 9; but 9 is leſs than 10, by an Unit; and conſequently, 9, multiply'd by 2 will be leſs by two Units, than 10 multiply'd by 2:

The Remainder therefore, will be 2, at every Operation, and equal to the Numerator at firſt, &c.

When a ſingle Digit thus repeats in the Quotient, it is call'd a *Single Repetend*, or *Circulate*, and is diſtinguiſh'd with a Daſh croſs it, *viz.* $\cancel{7}$, $\cancel{8}$, &c. thereby ſaving the trouble of inſerting any more than One, or ſuch a Number of them, as in every *Operation*, ſhall be found convenient.

From the ſame Principle, it is evident, that any Series of Digits, *&c.* having ſo many 9s for the Denominator, as are the ſaid Number of *Digits*, &c. the ſame *Fraction* reduc'd to a *Decimal*, will always give the ſame *Digits*, &c. continually repeating (or circulating) in the Quotient.

EXAMPLE IV.

```
148 }
——— }   999 ) 148.000 ( .148
999 }          4810
                8140
                (148)
```

Here, the Remainder, as well as the Quote, is equal to the Firſt Dividend; and conſequently, proceeding on in the Diviſion, it will continually be ſo: For 148 into 1000, will always exceed 148, into 999, by 148 Units; the Difference between 1000, and 999, being Unity. From whence it may be very eaſily deduc'd, that whenever any *Decimal Fraction* circulates, or repeats, *&c.* ſo many 9 s as are the ſaid repeating Places in the *Fraction*, will ever be the Denominator thereto.

THESE Circulates, when they conſiſt of more han a ſingle Digit, or Place, are call'd *Compound Repetends*, and have always the Firſt and Laſt laſh'd, to diſtinguiſh them as ſuch.

FOR a Series of .9s continually circulating nd decreaſing, in manner aforeſaid, there is always ſubſtituted Unity, or One.

THE Demonſtration hereof may eaſily be obain'd, from the following known Rule in Arithmetic, *viz.*

IN a Series of *Terms*, in a continu'd Proportion, multiply the greater Extreme by the *Ratio*; and from the Product ſubtract the leſſer Extreme; he Difference divided by the *Ratio*, leſs Unity, gives the Sum of all the Series.

THUS, in a Series of .9s deſcending, in the bove *Ratio*, it will be .9, .09, .009, .0009, &c. ill at laſt it will terminate in 0; that is, between 9 and 0. There are an infinite (or, if not allow'd hat Expreſſion) an indefinite, indeterminate, or naſſignable Number of ſuch Terms.

THEREFORE, as the leaſt Extreme is here 0, the above Rule of finding the Sum is reduc'd o this, *viz.*

THE Greater Extreme multiply'd by the *Ratio*, and that *Product* divided by the ſaid *Ratio*, eſs Unity, gives the Sum of all the Series.

IN the preſent Example, .9 being multiply'd by 10, the *Ratio*, it becomes 9, Integral; whic divided by the *Ratio*, leſs Unity, *viz.* 9, give Unity, or One, equal to the Sum of all the Series, *&c.*

BY the ſame Method may the Truth of all the other Circulates be prov'd, *viz.*

.2 .02 .002, &c. equal to $\frac{2}{9}$, as at firſt.
.148 .000148, &c. *ditto* to $\frac{148}{999}$

IN the laſt Caſe, 1000 is the *Ratio*; by which, if .148 be multiply'd, it becomes 148, Integral; which being divided by 999, the *Ratio*, leſs Unity, gives the Sum, as above. The like of all others.

BY which it is alſo demonſtrated, that if ſingle Digit circulates, 9 is the Denominato thereto; and, in general, ſo many Places as th circulating *Factor* conſiſts of, ſo many 9s will eve be the Denominator thereto.

ANY one of the Digits, or Places of a compound Repetend may be made the Firſt thereof ſo .148 may be made .1481; or .14814; &c. I the Firſt, the Repetend begins at 4, in the Secon at 8: But care is to be taken, that the ſam Number of Places, from where they are th made to begin, be alſo made to circulate, as a firſt, and to diſtinguiſh them, by daſhing the Fir and the Laſt, *&c.*

Repetends, beginning at the ſame Place (whic they may always be made to do, *per* the Laſt) whether at Primes, Seconds, *&c.* and ending at th ſame Place, *viz.* Primes, Seconds, *&c.* are call' *Conterminous.* Conſequently, Repetends, contai

in

ing an equal Number of circulating Places, are Conterminous.

AND any two, or more Repetends may alſo be made to end together, and ſo become Conterminous, if they are continu'd on to ſo many Places, that with the Place where they begin together, the Number of 'em ſo continu'd, be the leaſt Common Multiple of the Numbers, expreſſing the Number of Places in every reſpective Repetend.

BEFORE I proceed any farther, it may be neceſſary, to lay down the Method of finding ſuch leaſt Common Multiples.

FIRST, There muſt be obtain'd, by common Rules, the greateſt Common Meaſure to two of the Numbers, *viz.*

DIVIDE the greater Number by the leſſer; and if nothing remains, that leſſer Number is the greateſt Common Meaſure requir'd. But if there be a Remainder, divide the laſt Diviſor by that Remainder; and if there be ſtill a Remainder, divide the laſt Diviſor by the laſt Remainder; and ſo proceed on, till you come to a Diviſion without a Remainder; and then this laſt Diviſor will be the greateſt Common Meaſure requir'd.

EXAMPLE I.

WHAT is the greateſt Common Meaſure to 612, and 540?

540) 612 (1
72) 540) 7
36) 72 (2

HERE 36 is the greateſt Common Meaſure requir'd.

EXAMPLE II.

WHAT is the greateſt Common Meaſure to 643536, and 4500?

4500) 643536 (143
19353
13536
36) 4500 (125
99
180
(0)

EXAMPLE III.

Anſwer, 36, the greateſt Common Meaſure; the ſame as in the preceding.

WHAT is the greateſt Common Meaſure to 13 and 45?

13) 45 (3
6) 13 (2
1) 6 (6
(0)

HERE, the laſt Diviſor, when 0 remains, is Unity; the greateſt Common Meaſure therefore is Unity: In which Caſe, the Numbers at firſt are always ſaid to be Prime to each other.

DEFINITION.

A Number is ſaid, to be a * Multiple of another, a greater of a leſſer, when the leſſer meaſures the greater, *viz.* when the greater being divided by the leſſer, leaves no Remainder; which leſſer Number is call'd an *Aliquot Part* of the Greater.

IN which Caſe, *Euclid* does not conſider Unity as a Number, as is plain from *Lib.* 7. *Def.* 2. viz.

Number is a Multitude, compos'd of Units.

TWO, or more Numbers being given, to find a Common Multiple to them.

RULE.

MULTIPLY all the Numbers continually, and the Product will be the Multiple ſought.

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* *Euclid, lib.* 7. *Def.* 5.

EXAMPLE I.

WHAT is a Common Multiple to 3, 5, 6, 9?

3
5

15
6

90
9
---
810 *Anſwer.*

TWO Numbers being given, to find their leaſt Common Multiple.

RULE.

FIRST, Find the greateſt Common Meaſure; then divide either of thoſe Numbers by that Meaſure, and multiply the Quotient by the other, or the other by the Quotient; and the Product will be the leaſt Common Multiple ſought.

EXAMPLE II.

WHAT is the leaſt Common Multiple of 24 and 32?

THE greateſt Common Meaſure to the ſaid Numbers, by the Foregoing will be found to be 8; either of which Numbers being divided thereby, and the other multiply'd by the Quotient, gives 96, the leaſt Common Multiple ſought, *viz.* which can be divided by 24, and 32, and leave no Remainder.

EXAMPLE III.

WHAT is the leaſt Common Multiple of 13 and 45?

THE greateſt Common Meaſure to theſe Numbers, was found to be * Unity; by which, dividing ither of the others (as Unity, in multiplying and dividing, gives ſtill the ſame Number, *&c.*) It follows, that the leaſt Common Multiple to two Numbers, prime to each other, is their Product, nd in this Example, 585, for Anſwer.

* *Vide* Ex. 3.

TWO, or more Numbers being given, to find heir leaſt Common Multiple.

RULE.

FIRST, Find the leaſt Common Multiple to Two of them; and then to this Multiple ſo found, nd the Third Number, find alſo the leaſt Common Multiple: and then to this laſt Multiple, and he Fourth Number propos'd, find likewiſe the eaſt Common Multiple; and ſo on, with the *5th*, *th*, &c. given Numbers, till the laſt is thus ope-ated with. The Multiple thus found, will e that requir'd.

EX-

EXAMPLE IV.

WHAT is the leaſt Multiple of 8, 12, 9, 15

8) 12 (1
4) 8 (2
(0)
4) 12 (3
8

Leaſt C. Mult. 24 of 8 and 12

9) 24 (2
6) 9 (1
3) 6 (
(0)
3) 24 (8
(9

Leaſt Common Multiple } 72 of
12 and

15) 72 (4
12) 15 (1
3) 12 (4
(0)
3) 72 (24
15

Leaſt Common Multiple of all 360

IF either of the Numbers propos'd, be an *A-*
quot Part of either of the others, that *Aliquot Pa*
may be omitted in the Operations.

E

EXAMPLE V.

WHAT is the leaſt Common Multiple to 3, 6, 8, 12, 9?

HERE 3 is an *Aliquot Part*, either of 6, 12, or and 4 of 8 or 12, and 6 of 12: Therefore 3, , and 6, may be omitted, and the leaſt Multiple 8, 9, and 12, found, as before, will be 72, for nſwer.

IF the leaſt Common Multiple found to the receding Numbers, be alſo a Multiple to ſome f the following, ſuch following Numbers may e neglected, or omitted in the Operation.

THIS is plain, from the laſt: For every umber muſt, as before obſerv'd, be an *Aliquot art* of its Multiple.

THE Operations of theſe Examples may be erform'd otherwiſe. Thus,

IF the Second be compoſ'd to the Firſt, divide e Second by their greateſt Common Meaſure, and cancel it, and place the Quote under . If the Third be compoſ'd to either, or both f the preceding uncancell'd Numbers, divide it y their greateſt Common Meaſure, continually lacing the Quotes beneath it, and cancel it, and l its Quotes, except the laſt; and ſo, if the ourth be compoſ'd to any, of all the preceding ncancell'd Numbers, divide it by their greateſt ommon Meaſures, continually, placing the uotes beneath it, under each other, and cancelng it, and all its Quotes, except the laſt; proceding, till you have uſ'd all the Numbers propoſ'd, pos'd, in the ſaid manner. Then, the Produ made by the continual Multiplication of all th uncancell'd Numbers, is the leaſt Common Multiple ſought.

In this Method* likewiſe, the Numbers tha are *Aliquot Parts* of others, may be omitted *Vide* the *following Operations.*

OPERATION I.

$$\begin{array}{r} \cancel{3},\ 5,\ 6,\ \cancel{9} \\ 3 \\ 6 \\ \hline 18 \\ 5 \\ \hline 90 \end{array}$$

90 * Anſwer.

* *Vide* Ex. 1.

OPERATION II.

$$\begin{array}{r} 8,\ \cancel{12},\ \cancel{9},\ \cancel{18} \\ 3\quad 3\quad 5 \\ 3 \\ \hline 15 \\ 3 \\ \hline 45 \\ 8 \\ \hline 360 \end{array}$$

360 Anſwer.

OPERATION III.

$$\begin{array}{r}
\cancel{3},\ \cancel{4},\ \cancel{6},\ 8,\ \cancel{12},\ \cancel{9}. \\
3 \\
3 \\
\hline
9 \\
8 \\
\hline
72
\end{array}$$

72 Anſwer.

THE reaſon of this laſt Method, may be eaſily ſeen, from the two former Rules ; and of them alſo, from the common Rules of Multiplication and Diviſion.

* * *

ADDITION *of* Single REPETENDS.

MAKE them all Conterminous ; that is, to end together, by producing them forward, *&c.* and then Add, as before ; only to the laſt Place to the right hand, Add as many Units as there are Nines in the Sum of that Row ; and that laſt Digit will be a Repetend.

EXAMPLE I.

LET it be requir'd, to Add $.\acute{3} + .08\acute{3} + .\acute{6}$ to-gether; alſo, $.0002$[illegible] $+ .001 + .0\acute{1}$.

Operation 1.	*Operation* 2.
$.\acute{3}33$	$.0002\acute{7}$
$.08\acute{3}$	$.00\acute{1}1\acute{1}$
$.\acute{6}66$	$.0\acute{1}11\acute{1}$
$1.08\acute{3}$	$.0125\acute{0}$

IF theſe Circulates have any Terminate Deci-mals (*viz.* ſuch as do not circulate) to be added with them, you muſt continue the Circulates to a Place beyond the ſaid Terminate, &c.

EXAMPLE II.

LET it be requir'd, to Add $5.86 + 2.\acute{3} + 4$ together; alſo $.434 + 74.2345 + 2.\acute{6} + 5.\acute{8}$.

Operation 1.	*Operation* 2.
5.86	$.43400$
$2.\acute{3}33$	$2.\acute{6}6666$
$4.\acute{7}77$	74.23450
	$5.\acute{8}8888$
$12.97\acute{1}$	$83.2240\acute{8}$

IN the firſt Operation, a Cypher is ſuppos' after 5.86, which in the Second is ſupply'd Therefore every Terminate may be conſider'd a Interminate, by making a Cypher or Cyphers th Repetend.

Su

SUBTRACTION *of* Single REPETENDS.

PLACE, and continue, as in *Addition*; only, when the Repetend of the *Subtrahend* is greater than that of the *Minuend*, increaſe the Latter by 9; then ſubtract (carrying One to the next Place, *&c.*) and the remaining Digit will be a Repetend.

EXAMPLES.

I.	II.	III.
24.7	$7.64\cancel{3}33$	12.7648
$12.\cancel{7}2$	2.7646	$2.\cancel{3}3333$
$12.4\cancel{7}$	$4.8787\cancel{3}$	$10.4314\cancel{6}$

THE Reaſon of ſo many Units being added in *Addition*, as are Numbers of 9s in the laſt Row o the right hand, and of borrowing a 9 in *Subraction*, is obvious, from the Proof, that 9 is lways the Denominator to theſe Single Repeends.

ADDITION of Compound REPETENDS.

IF the Repetends to be Added, are conterminous; that is, conſiſt of an equal Number of Places, Add as before; only, to the laſt right hand Place Add as many Units, as there are Tens in the Sum of that Row, or Column, where the Repetends all begin together; and the Digits, &c. ſubſcrib'd to the ſaid two Places, will be the Firſt and Laſt of the Repetend.

EXAMPLE.

LET it be requir'd, to Add $\dot{2}\dot{7} + \dot{4}\dot{8}$ together; alſo $\dot{2}\dot{7} + \dot{5}\dot{4} + \dot{2}\dot{7}$.

Operation 1.

$$\begin{array}{r} .\dot{2}\dot{7} \\ \dot{4}\dot{8} \\ \hline .\dot{7}\dot{5} \end{array} \ \textit{Sum.}$$

Operation 2.

$$\begin{array}{rl} .\dot{2}\dot{7} & \\ .\dot{5}\dot{4} & \\ .\dot{2}\dot{7} & \\ \hline 1.08 & \\ 1 & \textit{to be added by the Rule.} \\ \hline 1.\dot{0}\dot{9} & \textit{true Sum.} \end{array}$$

THE Firſt Operation is obvious; the Second, (before the Addition of the Unit, according to the *Rule)* is really $\frac{108}{99}$, *viz.* 108 to be divided by 99: But, by pointing off the two Places, as at firſt, it is thereby divided by * 100; which is making the Sum too little, by one *99th* Part of the Number of Tens; the two laſt Places to the right hand, *viz.* .08, *per Operation* 1. (which is very

* Not. ii. Ex. 3. Conf. 3.

very plain) will be two Circulates: Therefore, the 99th Part of the Number of *Tens*, &c. which is here 1, will (by what has been already prov'd) be the Circulating Expreſſion, $\cancel{0}\cancel{1}$, which added to the Sum firſt found, gives the true Sum requir'd, and is a Proof of the *Rule*. The like of all others.

Other EXAMPLES.

I.	II.	III.
$8.5\cancel{0}3\cancel{8}$	$43.\cancel{7}6\cancel{4}$	$7.8543\cancel{7}$
$2.9\cancel{4}1\cancel{1}$	$21.\cancel{4}5\cancel{0}$	$16.\cancel{6}432\cancel{1}$
$11.5\cancel{3}5\cancel{3}$	$65.\cancel{7}2\cancel{1}$	$24.\cancel{4}975\cancel{4}$

* * *

To Add a Compound Repetend *to a* Terminate Decimal.

RULE.

TO the ſaid Terminate, add ſo many Cyphers as the Repetend conſiſts of Places: Next, continue the Repetend, equal to the Number of Places (Cyphers included) in the ſaid Terminate; then, adding as before, gives the Sum requir'd; which will have a Repetend, equal in Number of Places, as before.

EX-

EXAMPLE I.

LET it be requir'd, to Add 12.4568 with $8.\acute{6}4\acute{6}$.

OPERATION.

$$\begin{array}{r} 12.4568000 \\ 8\ \acute{6}4\acute{6}6466 \\ \hline 21.1034\acute{4}6\acute{6} \end{array}$$

THE Repetend now is $\acute{4}6\acute{6}$; but in Compound Repetends, you may begin at any Place, as before obſerv'd, continuing the Digits in ſucceſſion, equal to the Number of Places in the Repetend at firſt, &c.

* * *

To Add Circulates, *whoſe* Compound Repetends *conſiſt of different Numbers of Places.*

RULE.

FIRST, (by the Foregoing) The leaſt Common Multiple of the Numbers expreſſing the Number of Places in each reſpective Repetend, muſt be obtain'd. Next, All the Repetends muſt be continu'd out to ſo many Places (that with the Place, where they all begin together) as ſhall be equal to the ſaid leaſt Common Multiple; when, adding, according to the *Rule*, gives the Sum requir'd: Which Sum will conſiſt of a Repetend, equal in Number of Places to the ſaid leaſt Common Multiple, and muſt have the Firſt and Laſt daſh'd accordingly.

EXAM-

EXAMPLE I.

Let it be requir'd, to Add together the following Numbers of two and three Places in the Repetends, *viz.* $3.4\cancel{1}2\cancel{7} + 2.\cancel{1}\cancel{4} + 6.5\cancel{4}\cancel{5}$.

OPERATION.

$$\begin{array}{r} 3.4\cancel{1}2\cancel{7}127 \\ 2.\cancel{1}414141 \\ 6\ 5\cancel{4}54545 \\ \hline 12.0\cancel{9}9581\cancel{3} \end{array}$$

Here the leaſt Common Multiple to 2 and 3, the Number of Places in each reſpective Repetend is 6. Therefore they are continu'd out to ſo ſo many Places, from the ſecond Row, or Column of Decimals, *viz.* the fartheſt Place but two, to the left hand; at which Place, all the ſaid Repetends begin together.

EXAMPLE II.

Let it be requir'd, to Add together, $2{,}\cancel{3}45\cancel{6} + \cancel{1}.0\cancel{4} + \cancel{3}.\cancel{7}$.

OPERATION.

2.345934593459
1.041041041041
8.737373737373

7.124349371874 *true Sum requir'*

In this laſt Example, 12 is the leaſt Common Multiple to 2, 3, and 4, the Number o Places in each reſpective Repetend; equal t which, are the Number of Places continu'd, from the firſt Column, or Row of Decimals to the le hand, where all the Repetends begin together.

If any Terminate Decimals are at any time t be Added herewith, by making Cyphers, the Repetend thereto, and proceeding as in *Rule*. 2, yo cannot fail of the Sum, &c.

EXAMPLE III.

Let it be requir'd to Add together .2 + .1 + .144.

OPERATION.

.2000000
.1818181
.1441441

.5259623

Here the leaſt Common Multiple to th Number of Places in each Repetend, *viz.* 2 an 3, is .6: The Sum of the Addition therefore wi con conſiſt of a Repetend of Six Places: Next, the Number of Tens in the Column, or Row, where the Repetends all begin together (*viz.* the fartheſt but one to the left hand) are 1: The laſt Place to the right hand in the ſaid Sum is therefore increas'd by 1; and the Sum and Repetend are, as in the Example.

THE above Fractions, expreſs'd vulgarly, are, $\frac{2}{15}$. $\frac{18}{99}$. $\frac{144}{999}$; which reduc'd and Added together by the Common Rules, become $\frac{3211}{6105}$, Sum of all the Fractions.

6105) 32110 (.525962 *reduc'd to a Decimal.*
15850
36400
58750
38050
14200
19900
1585 Same as the ſecond Re-nainder, which gave 2 in the Quotient. Where-ore it will again repeat, as daſh'd above, and which s equal to the Sum, according to the *Rule*, &c.

IN *Example* II. the Number of Decimal Pla-es in the Sum (the Repetend being compleated, ccording to the *Rule*) are 12: But generally, ive or ſix Places, at moſt, will be found ſuffici-nt: So, .124349 may be taken for Uſe; which a very ſmall matter (almoſt inſignificant) too ttle. Or, ſeeing the laſt Digit to the right hand 9, the preceding Digit, *viz.* 4, may be made 5; nd then .12435, in moſt Caſes, may be us'd in eu thereof, without any regardable Error. This eing obſerv'd, Approximates may alſo be made erminates, &c.

SUBTRACTION *of* DECIMALS, *wit*
Compound Repetends, &c.

PRepare, as in *Addition*: Next, ſee if you mu borrow One, in ſubtracting, from the Pla where both Repetends begin: For then the la right hand Place of the Remainder will by tha means be a Unit leſs than otherwiſe it would be The reaſon of this is plain, it being the Converſ of *Addition*, &c. The Repetend, in the Anſwe will be as in *Addition*.

EXAMPLES.

31.71257	48.7327327	13.9778960
8.4772	1.5171717	8.7647647
23.23084	47.2155610	5.2131313

78.5722	48.7612000
3.7647	23.8548548
74.7874	24.9103451

MUL

* * *

MULTIPLICATION *with* Single Repetends.

CASE I.

IF the Multiplicand has a Single Repetend, and the Multiplier be Terminate, multiply by each Digit of the Multiplier, adding to the Product made by each Digit, and the ſaid Single Repetend, ſo many Units as there are 9s contain'd therein; the remaining Digit, &c. over and above the Carriage will be a Repetend.

NEXT, The circulating Digits in the reſpective Products, muſt be continu'd out to the laſt Place to the right hand of the firſt Product; when, adding according to the *Rule*, gives the true Product requir'd.

EXAMPLES

I.	II.	III.
$48.7\cancel{8}$	$31.7\cancel{8}$	$48.6\cancel{4}$
$.\cancel{7}$	4	6.34
$34.12\cancel{8}$	$127.0\cancel{7}$	$1945\cancel{8}$
		$1459\cancel{3}3$
		$2918\cancel{6}66$
		$308.405\cancel{8}$

WHEN the Multiplicand is a Terminate Expreſſion, and the right hand Digit of the Multiplier a Repetend, multiply as with a terminate Digit, ſetting the Product one Place forwarder than uſual, to the left hand, ſupplying the right hand Place, with a Cypher; which Reſult being divided by 9, the Quotient (which at the laſt Place will contain a Single Decimal Repetend or; o) will be the true Product requir'd.

EXAMPLES

I.	II.	III.
45	8.734	1276.47
.4	3.4	4.13
9)1800	9)349360	425490
20.0	38817	127647
	26202	501588
	30.0837	5276.0760

IN the Third Example, where the circulating Digit is 3, one third Part of the Multiplicand (being ſuppos'd a Place forwarder) is taken; for three Ninths, is equal to one Third.

CASE III.

WHEN both the Multiplicand and Multiplier conſiſt of a Single Repetend, then, as the Multiplicand is a Repetend, there muſt be ſo many Units, as are the 9s contain'd in the Product, added thereto. Next, as the Multiplier is alſo a Repetend, the ſaid Product muſt be likewiſe divided by 9, as before, till you arrive at a Single or Compound Repetend, &c.

EX-

EXAMPLES.

I.	II.	III.
2.3	48.754	3.47
5.6	2.13	2.4
)1400	1625148	9)1391
	4875444	
155	97508888	15456790123
1166		69555555555
	1040.09481	
13.22		8.5012345679

* Vide Ex. 3. Caſe 2.

In the ſecond and third Examples, where the Repetends are Compound, the reſpective Products are Added, according to that *Rule* in *Addition*, &c.

Also, in the Third Example, where divided by 9, the Circulating Unit is brought down at every Step.

* * *

MULTIPLICATION *of DECIMALS*, *having* Compound Repetends.

CASE I.

If the *Multiplicand* has a *Compound Repetend*, and the *Multiplier* be a Terminate Expreſſion, multiply as uſual, adding ſo many Units, [*Vide* P. 60. *Oper.* 2.] to the right hand Place of the Product made by each Digit, as there are Tens in the Product made by the ſaid Digit, and the left hand leading Digit of the Repetend; each of which Products will contain a Repetend, equal in Number of Places to that in the *Multiplicand*;

which being made Conterminous, and added t gether, gives a Repetend alſo, of the like numb of Places in the *General Product*, viz. the Sum all the aforeſaid Products.

EXAMPLES.

I.

$$\begin{array}{r} 8.7\cancel{0}4\cancel{3} \\ 7 \\ \hline 61.3\cancel{8}1\cancel{0} \end{array}$$

II.

$$\begin{array}{r} 218\cancel{4}.6732 \\ .05 \\ \hline 109.2\cancel{3}366\cancel{7} \end{array}$$

III.

$$\begin{array}{r} 8.6\cancel{7}1428\cancel{5} \\ 1.19 \\ \hline 780\cancel{4}2857\cancel{1} \\ 86\cancel{7}1428\cancel{5}7 \\ 86\cancel{7}1428\cancel{5}71 \\ \hline 10.318\cancel{0}9999\cancel{9} \end{array}$$

Which is 10.319

IV.

$$\begin{array}{r} 417.6\cancel{3}2\cancel{8} \\ 76.45 \\ \hline 20881\cancel{6}2\cancel{6} \\ 16705\cancel{3}0\cancel{1}3 \\ 25057\cancel{0}5\cancel{1}95 \\ 29234\cancel{7}7\cancel{7}277 \\ \hline 31928.007\cancel{1}1\cancel{7} \end{array}$$

In theſe Operations, it is convenient, previo to ſetting down the firſt Digit to the right han in every particular Product, to obſerve what th Carriage, or Number of Tens in the Product the leading Place, or Digit to the left hand i the Repetend, are; which may then be more con veniently added to the righthand Place of the ſa Product. Alſo in Adding up the whole, to obſerv the ſame in the Place where the Repetends all b gin together (which in this Caſe is always under th leading Repetend Place of the *Multiplicand*, as i the *Fourth Example*, &c.

I

CASE II.

If the *Multiplier* be a Compound Repetend,
d the *Multiplicand* a Terminate Expreſſion,
ultiply by each reſpective Digit, as in the com-
on way, *&c.*

Next, Set the higheſt Place, or Digit to the
ſt hand of the Product, a Place lower to the
ght hand under the ſaid Product, than are the
umber of Places in the multiplying Repetend;
d ſo many of the Places in the ſaid Product, in
rder, after it, as will terminate with the laſt
ght hand Place of the ſaid Product, repeating it
the ſame manner under this laſt Placing; and ſo
n, till the ſaid higheſt Digit or Place in the Pro-
uct be carry'd to the laſt Place to the right hand
the Firſt Product; which being then added up
gether, this laſt Reſult will be the *true Product*,
ntaining a Repetend of a like Number of Pla-
ith the *Multiplier*; obſerving, as in the Prece-
ing, to add to the laſt right hand Place thereof,
many Units, as are the Number of Tens in
at Column, where all the Repetends begin
gether; which, in this Caſe, will be ſo many
laces from the laſt, to the right hand, incluſive,
are thoſe in the Repetend of the Multiplier.

EX-

EXAMALES.

I.

25
.7̸7̸

175
50

6.75
6

6.8̸1̸ *true Product.*

II.

417.64
4.217̸

292348
41764
83528
167056

1761.18788
17611
1

1761.36̸401̸ *truePro*

In the Firſt Example, the *Product* is divide by 100, but ſhould have been but by 99, anſwer ing in fact to the *Multiplier*; the ſaid 75 wi therefore be a Circulate, or Repetend; and 6 which is alſo to be divided by 99, gives 0̸6̸, a Re petend. [*Vide Addition.*] By which, the Fir *Product* being increas'd, gives 6.8̸1̸, the *true* Pro*duct*, and is a Proof of the *Rule*, &c.

EXAMPL

EXAMPLE III.

```
    47253.375
         1.48
  -----------
    378027000
   189013500
   47253375
  -----------
   69934995..
      6993499
         6993
            6
  -----------
   70005.99090
That is, 70005.
```

CASE IV.

IF the Multiplier conſiſts of Terminate Pla- es, with a Compound Repetend, ſet the higheſt eft hand Place thereof, ſo many Places clear- y below it ſelf, to the right hand, under the aid Multiplier, [*Vide Caſe* 2.] as are the Number f Places in the Repetend; and alſo ſo many nore of the Places, in order after it, as will Ter- ninate with the aforeſaid Multiplier; from which ubtracting the ſame, the Remainder will be a ew Multiplier; by which Multiplying, and rdering the Product, according to the Number f Places at firſt in the Repetend, [*Vide* Examples o *Caſe* 2. P. 72.] gives the *True Product* requir'd. he Demonſtration of this Rule, you will find at *iviſion*, Example 4.

EXAMPLE I.

```
   48.76
   .1343
       1
   -----
    1344 New Multiplier.
   -----
   19504
  19504.
 14628..
 4876...
 -------
 6553344
    6553
       6
 -------
 6.559803 True Product.
```

EXAMPLE II.

```
     432.43
     23.414
        234
     ------
      23180 New Multiplier.
     ------
    345944
    43243
  129729
  86486
 ----------
 1002372740
   10023727
     100237
       1002
         10
 ----------
 1012497717  True Product.
```

Or if the Terminate Places in the *Multiplier* exceed thoſe in the *Repetend*, you may multiply by the Repetend Places firſt; to which find the true Product, as before: Next, multiply by the Terminate Places; which ſeveral *Products*, &c. added to the aforeſaid *True Product* of the Repetends, as in other Multiplications, gives the *True Product* requir'd.

EXAMPLE III.

43243
$23.4\dot{1}\dot{4}$

605402 Product, *by* $\dot{1}\dot{4}$ *in one Line.*
6054
60

$6115\dot{1}\dot{7}$ *True Product of Repetends.*
$172972..$
$129729...$
$86486....$

$10124.977\dot{1}\dot{7}$ *True Product of the whole.*

CASE V.

If both the *Multiplicand* and *Multiplier* conſiſt of *Compound Repetends*, operate as in the following Examples, which take in all the preceding Caſes.

If the Firſt *Product* contains any * Repetend, it will be equal in Number of Places to that in the *Multiplicand*, and may be continu'd out at pleaſure.

* V. Ex. 1. *where the* Repetend *vaniſhes.*

Next, Divide the ſame into Periods, beginning at the left hand; each Period to contain as many Places, as does the *Repetend* of the *Multiplier*:

[*Vide Caſe* 2.] Then the whole Firſt Period muſt be added to the Second, and this Reſult to the Third, and ſo on. But when the Sum of any Period conſiſts of all 9s; or the preceding Period be increas'd an Unit from the ſaid Sum, the laſt place to the right hand in the ſaid Period † (as well as in the preceding) muſt alſo be made One more. Proceed thus, till you arrive at a Repetend, or to ſuch a Number of Places as ſhall be thought proper; which will be ſo far the *True Product* requir'd.

† *Vide* Addition

EXAMPLE I.

$$\begin{array}{lr}
 & 2.1\cancel{7}\cancel{2} \\
 & 11\cancel{1}.\cancel{0}8 \\
 & 11 \\
\hline
\textit{New Multiplier} & 11187 \\
\hline
 & 2\ 152\cancel{0}\cancel{0} \\
 & 738\cancel{1}8 \\
 & 2\ 1\cancel{7}\cancel{2}72 \\
 & 21\ \cancel{7}\cancel{2}727 \\
 & 21\ \cancel{7}\cancel{2}7272 \\
\hline
 & 243.062\cancel{0}\cancel{0} \\
\textit{That is,} & 243.063 \\
 & |243 \\
\hline
 & 243.30\cancel{6}\ \textit{True Prod.}
\end{array}$$

In this Example (*per* Caſe 1.) the Repetends in each *Product* begin at the ſecond Place from the right hand, and are made Conterminous.

In Adding up theſe ſeveral *Products*, when made Conterminous, the Repetends all begin together at the Second Place to the right hand, under the he *leading Repetend* Place in the *Multiplicand*, *per* Caſe 1.) as is alſo plain from *Addition*, the *Multiplicand* being only added up ſo many times o it ſelf, as the *Multiplier* contains Unity.

Laſtly, This *Firſt Product* being (*per* Caſe 2.) ivided into Periods, and order'd according to the ule, the laſt Reſult, or *True Product*, will contain *Repetend* of three Places, as in the Example, &c.

EXAMPLE II.

```
                    111̇·9̇8
                     2.17̇7̇
                        21
                    ────────
ew Multiplier        2.151
                    ────────
                    111̇9.8
                   550̇90̇9
                  111̇98̇19
                 223̇90̇396
                ─────────────────
irſt Prod.      240872̇·24̇·3243
                    24|32|06|30|62
                ─────────────────
                24|32|06|30|62|06
                    1         1
                ─────────────────
                2̇4̇3·3̇06̇306306,   True Prod. as
                                [in the preceding Example.
```

EXAMPLE III.

Let it be requir'd, to multiply 3.148 by 4.29 the new Multiplier will be found to be 4.293.

```
              3.1 4 8
              4.2 9 3
             ---------
              9 4 3 6
           2 8 3 0 0 0
           6 2 0 0 9 0
       1 2 5 8 1 8 1 8
       ---------------
First Prod.  1 3.5 0 3 4 3 6 3 6 3 6 3 6 3 6 3 6
                   |1 3 5|1 6 9|5 3 2|1 6 9|5 3 2
             ------------------------------------
              1 3.5|1 6 9 5 3 2|1 6 8|     |
                   |     |     1|    1|     |
             ------------------------------------
True Prod.   1 3.5 1 6 9.5 3 3 1 6 9 5 3 3 1 6 9
      Viz.   1 3.5 1 6 9 5 3 3, &c.
```

It frequently happens, and chiefly, when th Places of the Repetends in the Factors, contai many Places, that the *Product* may be continu' to a Multitude of Places, before it will repeat,& But ſuch Mutlitude of Places, tho' Curious, ar too burthenſome for Uſe. Wherefore it may b carry'd only to ſuch a Number, as ſhall at an time be judg'd convenient.

Or, if the ſaid *Firſt Products* in the precedin Examples be ſeverally divided by ſo many 9 s a the Repetend in the *Multiplier* conſiſts of Place the Quotients will likewiſe give the *True Produ*

Vi

Vide Example I. *Caſe* 5.

Firſt Prod.

999)243.063 (243.$\dot{3}$0$\dot{6}$ *True Prod. as before.*

43 26

3303

3060

6300

Remainder (306) Same as when $\dot{3}$ took place in the Quote.

Vide Example II. *Caſe* 5.

Firſt Prod.

99) 24087.$\dot{3}$2$\dot{4}$ (243.$\dot{3}$0$\dot{6}$ *as above.*

428

327

30$\dot{3}$

6$\dot{7}\dot{4}$

Remainder 30 Same as when $\dot{3}$ took place [in the Quote.

In dividing by the 9s, &c. the Decimal Places anſwering to the Multiplicand only, are to be pointed off in the ſaid Firſt Product, &c.

By comparing the Operations of theſe Compound Repetends, with thoſe of the Single, it may be eaſily ſeen, that the ſame Reaſon takes place in both; the former only involving more 9s in every Operation; and by which their whole Proceſſes may be alſo clearly demonſtrated.

An Example or two will clear this up.

EX-

EXAMPLE I.

Let it be requir'd, to multiply 234 by (which is dividing the ſame by 9.) *Vide* P.45.

The Multiplicand, which is here the Product being order'd according to *Ex.* II. *Caſe* 2. *P.* 7 will be as follows.

234
23
2
———
25.9
That is, 26.0 [*Vide Page* 47. and *Addition* *Single Repetends*, &c.]

This will be plain, from what has been al ready prov'd, *Page* 45, &c. For 2, the firſt Digit being divided by 9, will be alſo the firſt Digit the Quote, and likewiſe a Circulate; and for th ſame reaſon, 3 will be the next Digit to be in th Quote, and a Circulate alſo; which, with the a foreſaid 2, that circulated, gives 5 for the ſecon true Digit of the Quote; and the ſaid 5 (3 an 2 both circulating) is now to be added to the la Digit 4; which, for the aforeſaid reaſon, bein likewiſe a Circulate, gives 9, a Circulate, a above, &c.

From Pages 45, 46, and the above way o reaſoning, the Demonſtrations to all the foregoin Rules evidently appear.

FROM the above Proof may alſo be ſeen, that when any Series of Digits are to be divided by 9, how the Quotient may more eaſily and expeditiuſly be obtain'd by *Addition*.

R U L E.

BEGIN at the laſt Place to the right hand, nd Add up the Digits in the Series, firſt drawing Line under them, as in *Addition*; and to the um Add as many Units as there are 9 s therein: et down the Remainder, over and above the arriage, a Place below the laſt Place, to the ight hand of the Series, to be Added, *&c.* which vill be a Cypher, or a circulating Decimal: Next, eaving out the laſt right hand Place in the ſaid irſt Series, Add the Carriage to the Digit next receding it, proceeding on, as at firſt; which um, as before, muſt be ſet down to the left hand f the laſt: Next, the two laſt Places to the ight hand of the ſaid firſt Series muſt be omited, and the Carriage carry'd to the next preceing them, and ſo on, omitting a Place each time, ill all are thus operated with, which will give the rue Quotient requir'd.

EXAMPLES of this may be made at pleaire.

THE Proof of this Rule will be obvious, by eginning at the Top of each Row, in the preceing Example, and Adding downwards.

BY this Rule alſo, *Example* 3, p. 69, will beome vaſtly eaſy, where the Product is divided y 9.

THE Examples, with Terminates and Singl Repetends, may be operated in the ſame manne as the Compound.

From Example II. *Page* 68.

8.734
3.4
1
——
31 *New Multiplier.*
——
8734
26202
——
270754 *Firſt Product.*
27075
2707
270 } *per* Caſe II.
27
2
——
300837 *True Product.*

OR, if this firſt Product, as before obſerv' had been divided by 9, it would have given t True Product, as under.

BY this Example alſo, 'tis very conſpicuou that the farthermoſt Row to the right hand, b ginning at the Top, contains the Digits and Plac in order in the Firſt Product; the next prec ding Row the ſame, beginning at the ſame Plac and ſo on: By which, the ſaid Product may mo eaſily be obtain'd, *per Addition*, as before, witho ſetting down any more Digits, &c. than in the fir Product.

Fr

From Example III. P. 69.

$$\begin{array}{rl} 3.4\cancel{7} & \\ 2.\cancel{4} & \\ \cancel{2} & \\ \hline 22 & \textit{New Multiplier.} \\ \hline 69\cancel{8} & \\ 69\cancel{8}5 & \\ \hline 765\cancel{1} & \\ \hline 8.5\cancel{0}1234567\cancel{9} & \end{array}$$

THE Circulating $\cancel{1}$ being continually added to the laſt Product, gives the True.

WHEN it came to 8, as the next Place would have been a Circulating $\cancel{9}$, the ſaid 8 is therefore made 9, and the ſucceeding Place a 0; which being the ſame at the 9*th* preceding Place, the Circulation of the Product is there compleated, and the Firſt and Laſt daſh'd accordingly.

BY all which, it is obvious, that the Principles on which the Operations of the Single Repetends depend, are the ſame with the Compound, as before obſerv'd.

* * *

DIVISION *of* DECIMALS, *with* Repetends, *&c.*

IF the Dividend contains a Repetend, and th Diviſor be a Terminate Expreſſion, the ſaid Repetend is to be continu'd, as neceſſary, and each reſpective Figure brought down to the Remainder in the Diviſion, [*Vide* P.69.*Ex* 3.] proceeding till you arrive at a Repetend, *&c.*

EXAMPLES

I.

8) 45.36̸ (5.67083̸
53
56̸
6̸6̸
26̸
(2)

II.

12) 72.1̸4̸ (6.0̸12̸
1̸4̸
24̸
(0)

INSTEAD of continuing out the Repeten in the Dividend, by daſhing each Digit, or Place that you take down to each Remainder, the nex in order, for that uſe, will be ſeen by Inſpection Alſo obſerve, if the like Remainder has happen' before in the Proceſs, the Digit, or Place anſwer ing thereto in the Quotient will be the Firſt of th Repetend; and that anſwering to the Remainde immediately preceding the ſame Remainder agai the Laſt. [*Vide* Page 52, &c.]

EXAMPLE III.

```
1.4 ) 72.1̸47̸ ( 51̸.53010̸
        21̸                14  Divisor.
          74̸              ———
           47̸    200̸12040̸
            1̸4̸   51̸53010̸1
ſame Remainder, 7̸1̸ ——— ———
as at the 2d Step,  72.1̸47̸142  Dividend.
anſwering to 1 in
the Quote.
```

HERE, after the Products by 14, are made Conterminous, there is an Unit added for the 10, n the Place where all the Repetends begin together, *viz.* the Sixth Place from the laſt right hand Place incluſive. The like of all others.

LEMMA,

IT is evident, that if any Number be multily'd by 10 (which is, adding a Cypher thereto,) nd from this Product, the ſame Number be ubtracted, the Remainder will contain 9 times he ſaid Number, *viz.* is equal to the *Product* of he ſaid Number into 9: Or, if every Number be o be multiply'd by 100, (which is adding two Cyphers thereto) and the ſaid Firſt Number be ubtracted from this *Product*, there will remain 9 times the ſaid Number; and ſo on.

THIS is juſt the Converſe to finding the Deimal Expreſſion of a Number, or *Fraction*, whoſe Denominator is 9 or 9s, *&c.* [*Vide* Page 45.] and y which it was meant, that it might eaſily be educ'd, that 9, or 9s, *&c.* was always the Deno-inator to ſuch *Fractions.*

EX-

EXAMPLE.

* Notat. Ex. 3. Conf. 6.

$\not{2}\not{2}$ multiply'd by 10, becomes 2.$\not{2}$ *.
From which ſubtracting .$\not{2}$

There remains —— —— 2, *viz.* 9 time
the firſt Numbe

Therefore, the ſame being divided by 9 will be thus expreſs'd, $\frac{2}{9}$, equal to the *Vulga Fraction* at firſt, &c.

Again,

.$\not{2}\not{7}\not{2}\not{7}$ multiply'd by 100, becomes 27.$\not{2}\not{7}$, *as abov*
From which ſubtracting —— $\not{2}\not{7}$

There remains —— —— 27 .. 99 time
[the ſaid firſt Numbe
Which being divided by 99, gives $\frac{27}{99}$, *Fraction a*
[*firſt*, &c

By this may alſo be very eaſily ſeen, the tru of ſumming up the Infinite, or Indefinite Series, &c.

Example *in the* Series *of* .9 s,

Viz. .99, &c. becomes 9.9, &c.
From which ſubtracting .9, &c.

Remains —— —— 9.0 *viz.* 9 time
[the firſt Number, or Quantit

Which therefore being divided by 9, gives Unit the firſt Number, or Quantity ; of which, all th Following were Parts, &c.

Th

THIS being premis'd, I proceed to the Diviſion of *Decimals*, whoſe Diviſors contain a Repetend, or Repetends.

EXAMPLE I.

LET it be requir'd, to divide 7, an Integral, by $\dot{5}$, a Circulate.

HERE $\dot{5}$ is really $\frac{5}{9}$, or 5 divided by 9; which, to be made Integral, muſt be multiply'd by 9; but to maintain the ſame *Ratio*, the Dividend muſt alſo be multiply'd by 9; and ſo the New Diviſor and Dividend will be 5 and 63: But by the Preceding, it has been ſhewn, that multiplying any Number by 10, *&c.* and from this *Product* ſubtracting the ſaid Number, the Remainder will be the ſaid Number multiply'd by 9, &c. [*Vide* the following Example.]

Diviſ. *Div^d.*
5.$\dot{5}$) 7 (
$\dot{5}$ 7

5) 63 (12.6 *True Quote.*
13
30
(0)

THE Cypher to the 7 in the Dividend, *&c.* (*viz.* when multiply'd by 10) is underſtood. [*Vide Lemma.*]

IF this laſt Diviſor and Dividend be now divided by 10, it will become as under, *viz.*

.5) 6.3 (12.6 *True Quotient, as before.*

By which may be ſeen, that making the Plac made by the Subtraction of the mov'd Dividend a Decimal, the Diviſor is thereby depriv'd of i Circulation; and the Operation becomes as i Terminates, &c.

EXAMPLE II.

Let it be requir'd, to divide 45, Integral, b 45, a Circulate.

.45) 45
45

.45) 44.55 (99 *True Quote.*
405
(000)

The Reaſon for moving the Dividend tw Places to the right hand of it ſelf, before Subtraction, is obvious, from the Principle of the preceding, and the latter Part of the *Lemma*; whic gives this Rule, *viz.*

When any Number is to be divided by Repetend, or Circulate Expreſſion, ſet the whol Dividend under it ſelf, in ſuch manner, that the may be ſo many Places beyond the laſt right han Place thereof, as are thoſe in the ſaid Repetend If the Dividend be Terminate, imagine Cyphers and ſubtract; which Remainder will be the Ne Dividend: Obſerving, that the ſame will now b increas'd ſo many Decimal Places, as remov'd t to the right hand.

IF the Dividend at firſt contains a Repetend, inſtead of ſuppoſing Cyphers, continue the ſame out ſo many Places as remov'd; when ſubtracting and dividing, as *per* former Rules, gives the true Quotient requir'd.

EXAMPLE III.

LET it be requir'd, to divide 70005 by $\dot{1}.4\dot{8}$.

```
       70005
          70005
      -----------
1.48 ) 69934.995 ( 47253.378
       1073
          374
           789
            499
             555
             1110
               740
              (000)
```

IF the Diviſor be both a Terminate and Repetend Expreſſion, order the Dividend by the Rule preceding.

NEXT, The Diviſor muſt be order'd, as before of the Multiplier. [*Vide* Caſe 4. p. 73.] When, dividing likewiſe, as *per* former Rules, gives the true Quotient requir'd.

EXAMPLE IV.

LET it be requir'd, to divide 243.30$\cancel{6}$ by 2.1$\cancel{7}\cancel{7}$.

2.1$\cancel{7}\cancel{7}$) 243.30$\cancel{6}$30
21 243306

2.151) 240.8732$\cancel{4}$ (11$\cancel{1}$.98
2577
426$\cancel{3}$
2112$\cancel{7}$
1763$\cancel{4}$
Remainder 426 Same as at 1 in the
[Quote, where the firſt *Repetend Digit* was.

IN this Example may be obſerv'd, that in ſubtracting the remov'd Dividend, the Place where the ſaid Repetends begin together is the Third Place from the laſt right hand Place incluſive: The new Dividend will therefore conſiſt of a Repetend of the like Number of Places, &c.

THE reaſon of ordering the Diviſor in the aforeſaid manner, is, that the whole Diviſor may have 99 for the Denominator, as well as $\cancel{7}\cancel{7}$, the Repetend Part. Suppoſe the Diviſor to be multiply'd by Unity, with ſo many Cyphers as are the Number of Places, in the Repetend, which in this Example is 100, and the Product 217.2$\cancel{7}\cancel{7}$; from which ſubtracting the aboveſaid firſt Diviſor, the Remainder will be 215.1, *viz.* 99 times the ſame *V. Lem.* &c. Wherefore, the *Diviſor* thus order'd, will have 99 for the Denominator; anſwering to which the Dividend is mov'd two Places below it ſelf, and ſubtracted; by which means the Dividend has 99 alſo for its Denominator; both which Denominators being now rejected, the remaining Numbers will retain the ſame *Ratio* (*Euc l.* 7. *Pr.*17.) whe dividing *per* Rule, &c. gives the *true Quote* requir'd

IT is likewiſe to be obſerv'd, that as the Diviſo

wa

was multiply'd by 100, the Decimal Point, by that means, was remov'd two Places lower to the right hand; the like of the *Dividend*. [*Vide* Ex.2. *Caſe* 5. p.79.] But as *per* the *Converſe* to the foreſaid *Prop.* if the laſt prepar'd Numbers be again divided by 100, the ſame *Ratio* will ſtill ſubſiſt, and the *true Quotient* had, as before; that Part of the *Operation* is therefore omitted. [*Vide* latter Part to *Ex.* 1. p.87, and 88.] It is likewiſe obſervable, that by moving the Diviſor ſo many Places below it ſelf, as are the Number of Places in the Repetend, the Repetend vaniſhes; as they will alſo in the Dividend, when equal in Places to thoſe in the Diviſor. [*Per* this, the Demonſtration to *Caſe* 4, p. 73, of *Multiplication*, is plainly ſeen.]

EXAMPLE V.

```
.03̇17̇)  395.2736̇14̇, &c.
   0 )      395273, &c.
          ──────────────
.0317 )  394.8783410, &c. (12456.73 Quote.
           778                     .03̇17̇ Diviſ.1.
           1447                    ───────
            1798              21176441  per 17 in
             2133            8737019    (one Line.
              2314           ──────────
                951          394878341
               (...)            394878
                                   394
                                ──────
                            395.2736̇14̇ Firſt Di-
                                     (vidend, &c.
```

EXAMPLE VI.

$$\begin{array}{r l}
417.\cancel{8}3\cancel{7}\,) & 709\cancel{3}3.6\cancel{4}336 \\
417\,) & 709\cancel{3}364 \\
\hline
417.215\,) & 70862.7\cancel{0}97\cancel{7}\ (\ 1\cancel{6}9.8\cancel{4} \\
 & 29141\ 2\cancel{0} \\
 & 4108\ 30\cancel{9} \\
 & 353\ 374\cancel{7} \\
 & 19\ 6027\cancel{7} \\
 & 291412
\end{array}$$

Same as when 6 [took place in the Quote.

In *Example* 5, the Repetends, by removing the Dividend, &c. vaniſh.

If before the Quotient repeats, it ſhould require a tedious Operation, you may leave off at what Number of Places may be found proper or convenient, &c.

* * *

Reduction *of* ASTRONOMICAL, *or* Sexageſimal Numbers *to* Decimal Expreſſions, *and the contrary.*

In this Caſe, you are to conſider, how many of the Denomination of the Number to be reduc'd, make one of the next ſuperiour Denomination *: For that will always be the Denominator thereto; which plac'd under the Number to be reduc'd, as in *Page* 43, gives the Vulgar Expreſſion thereof: When, proceeding according to the Rules there laid down, &c. you will have the Decimal Expreſſion requir'd.

* *Vide* Page 2.

EXAMPLE

EXAMPLE I.

LET it be requir'd, to reduce 47″ to a Decimal Expreſſion, *viz.* $\frac{47}{60}$, of a Minute, Vulgarly; which being order'd for Operation, will be as under. [*Vide Notat. Ex.* 3. *Conſec.* 3. and the *Converſe Rule*, p. 34.

6) 47 (.783 *Decim. Expreſſion requir'd.*
50
20
(2)

BUT if it be requir'd, to know the Decimal Expreſſing, what part of a Degree the ſaid 47″ is; as 60′ make a Degree, [*vide* Page 2.] the ſaid 47″, *viz.* the Decimal Anſwering thereto, muſt again be divided by 60.

EXAMPLE II.

6) .0783 (.01305 *Decimal Expreſſion requir'd.*

Which you will find in the *Table*, titled, *Seconds of a Degree*; and by which Method the ſaid Table was conſtructed.

IF it be requir'd, to find the Decimal Expreſſion for 47′; as 60′ are equal to a Degree, the next ſuperiour Denomination, the aforeſaid .783 will be the Expreſſion requir'd; and by this Method was the *Table*, titled, *Minutes of a Degree*, conſtructed. Both which Sums added together, as follows, will be the Expreſſion of 47′ 47″.

EXAMPLE III.

.01305
.78333

79638 *Decimal Expreſſion requir'd.*

By this Method, may the Decimal Expreſſio of Minutes and Seconds be at any time obtain' from the Tables.

Or, having found the firſt Decimal Expreſſion o $47''$, viz. ·783, by prefixing thereto the $47'$, an dividing by the Rule, you will likewiſe have th Decimal Expreſſion of Both.

EXAMPLE IV.

6) $4{\cdot}778\cancel{3}$ (·79638 *as before.*
57
38
2$\cancel{3}$
5$\cancel{3}$

Let it be requir'd, to find the Decimal Expreſ ſion of $1'$, $0''$, $40'''$ of a Degree, *viz.* ſuppoſing Degree to be the Integer.

When the Parts of the Integer, as in th Example are of different Denominations, the be way will be, to place them in the following Orde dividing according to the Rule; and placing th Quotes immediately to the right hand of the ne ſuperiour Denomination.

EXAMPLE V.

6 | 4.0
6 | .0 $\cancel{0}$
6 | .10$\cancel{1}$
.01685$\cancel{1}$ *Decimal Expreſſion requir'd*

In the ſecond Place, where the Seconds we Nothing, a Cypher was there plac'd, which w afterwards pointed off to the right hand, as div ding by 6, inſtead of 60, &c.

EXAMPLE VI.

Laſtly, Let it be requir'd, to find the Decimal
xpreſſion to 4 S. 9° 23′ 3″ 30‴.

HERE it is to be obſerv'd, that the whole
ircle, or 12 Signs is now the Integer, and the
ueſtion, what is the Decimal Expreſſion of the
foreſaid Part thereof?

6	3.0
6	.35
6	2.30583
3	.9384308
12	4.3128101883
	.35940084876543209 *Decim. requir'd.*

IN the Fourth Step, it is divided by 3, which,
deed, is by 30; becauſe 30 Degrees make a
gn: But the 9 was pointed off; which is divi-
ng that Expreſſion by 10; and conſequently, 3
the Quotient of 30, divided by 10, &c. [*Vide*
e Converſe Rule, *p.* 34.

IN the laſt Reſult, tho' continu'd to ſo many
aces, the firſt Four will be found ſufficient for
ſe: Or, ſeeing that 8, which ſucceeds immedi-
ely the two Cyphers following the firſt four Pla-
s, is conſiderably above 5, an Unit may be ſub-
tuted for it in the next preceding Place; and
is may be done at any time diſcretionally, ac-
rding to the Accuracy requir'd, when the Quoti-
ts, &c. flow on to many Places.

THE Rules apply'd in finding the Decimal
preſſions to theſe *Sexageſimal Numbers*, are uni-
rſal to all others, having due regard to the Di-
ſtion firſt laid down, *viz.* How many of the
De-

Denomination to be reduc'd, make One of the ne Superiour, &c.

Any Decimal Expreſſion being given; alſo the Den mination of the Integer it reſpects; To find the V lue thereof in the next inferiour Denomination, &

THIS is the Converſe of the former: Fo having conſider'd, how many of the next inferi our Denomination make (or are equal to) the I teger the ſaid Decimal Expreſſion reſpects, multi ply the ſaid Decimal Expreſſion thereby; whe pointing off ſo many Places in the Product f Decimals, according to the Rules before la down, the Remaining to the left hand will be t Anſwer requir'd.

EXAMPLE I.

LET it be requir'd to find the Value of .7 of a Minute.

HERE the next lower Denomination to M nutes, are Seconds, 60 of which are equal to o Minute. Multiply .783 therefore by 60, and t Product will be the Anſwer. As in *Diviſion*, t Numbers to be divided by 60, were previouſly d vided by 10, and then by 6; ſo, converſly, th may in theſe Caſes be multiply'd by 10, and th by 6; which is, pointing off a Place to the hand, or conceiving it to be ſo; and then tiplying by 6, which gives the Anſwer requir'd. otherwiſe, by pointing off a Place leſs in the duct for Decimals; all which is very obvious.

O

OPERATION.

$$\begin{array}{r} 7.83 \\ 6 \\ \hline 47.00 \end{array}$$ *Anſwer requir'd*, viz. 47'.

EXAMPLE II.

LET it be requir'd, to find the Value of .35940084876543200 of a Circle, (*viz.* the Circle being the Integer) in Signs, Degrees, Minutes, &c.

HERE the next inferiour Denomination is Signs, of which 12 make the Circle, or Integer; by which multiplying according to the Rule, and ſo on, you will have the Anſwer requir'd; which you will find to be the Converſe of the Preceding, &c.

AND here it may be obſerv'd, that making uſe of .3594008 5, will be found accurate enough, thereby leaving out the Repetend of 9 Places. *Vide* Example.

```
      .35940085
             12
  S. ----------
      4.3128102
              3
       °  -----
       9.384306
              6
       ′  ------
       23.05836
              6
       ″  ------
         9.5016
              6
       ‴  ------
         30.096
```

In the Product per 12, the 0, as being of no Value at the End of a Decimal Expreſſion, is omitted; as is alſo that after 3, in the next Operation, and a Place leſs pointed off in the Product made thereby. The ſame in the following Products is alſo obſerv'd.

In the Product by 12, the Decimals being pointed off, the Integral Part to the left hand are Signs, and the Expreſſion ſo pointed off, the Decimal Parts of a Sign; which, as 30 Deg. are equal to a Sign, is therefore multiply'd thereby, &c. The like Reaſoning takes place in the other Products.

From the 6th Example of the laſt, it may be obſerv'd, that notwithſtanding 9 Places to the right hand in the exact Decimal Expreſſion are curtail'd; yet the true Anſwer, even in Thirds, is brought forth, the Expreſſion beyond that being in this caſe of no conſideration at all. By which, a Perſon, with a little reflection, may at any time abridge ſuch Multiplicity of Places, without any ſenſible Loſs: For in ſome Caſes, .3594 will be ſufficient; or 359401, *&c.* and this at diſcretion, according to the Accuracy requir'd, as before obſerv'd.

IF (as before) the Method of reaſoning in the Reduction of theſe Decimal Expreſſions, be carefully obſerv'd, it will be found to extend to Numbers of all Denominations whatever.

THUS, having finiſh'd the Theory of *Decimals*, I proceed to the next Subject-Matter of this Treatiſe, *viz.* the Compendious Calculation of the Places of the Luminaries; wherein the Uſes of the ſaid Decimals, both Terminate and Circulate, (which in Computation, may be deem'd Univerſal) will conſpicuouſly appear.

* * *

OF

Of the Calculation of the Places *of the* Luminaries: *With the Uſes of the following* Tables.

IT will be neceſſary, previous to the Calculation of the Sun's Place, to inſtance the Principles on which the Table of his Mean Motion and Anomaly for every Fourth or Leap-Year were conſtructed.

The Tropical Year, *viz.* from the Sun's Entrance into any Point of the Ecliptic, ſuppoſe the Equinoctial Point *Aries* (from whence the mean and true Longitudes are always reckon'd) to his next Return to the ſaid Point, is found, according to the lateſt Obſervations, to conſiſt of 365 Days, 5 Hours, $48'$, $54''$, $46'''$, $28''''$, and $25'''''$, and the Motion of the Sun's Apoge for the ſaid Time $1'$ $0''$ $40'''$. But in every common Year, there are taken into the Account 365 Days only.

By an accurate Computation, the Mean Motion or Longitude of the Sun for 365 Days will be found to be 11^{s}, 29°, $45'$, $40''$, $14''$, $15''''$, $31\frac{1}{2}'''''$.

Therefore, if the Sun on any Day of the Month at Noon be in the firſt Scruple or Point of *Aries* the enſuing Year (*viz.* a common Year of 365 Days) he will on the ſame Day of the Month at Noon want $14'$ $19''$ $45'''$ $44''''$ $28\frac{1}{2}'''''$ of that ſaid Point, *viz.* the Complement of the aforeſaid Mean Motion 11^{s} 29° $45'$ $40''$ $14'''$ $16''''$ $43'''''$ to the Circle or 360 Degrees.

The following Year he will want $28' 39'' 31''' 28'''' 57'''''$, *viz.* twice the ſaid Quantity, the third Year $42' 59'' 17''' 13'''' 25\frac{1}{2}'''''$, three Times, and the fourth Year $57' 19'' 2''' 57'''' 54'''''$, four Times the ſaid Quantity; which laſt being near the Motion of a Day, *Julius Cæſar* (by whoſe Account we ſtill reckon) added a Day every fourth Year to that Year, making it to conſiſt of 366 Days, and called it *Biſſextile*, from *bis* twice, and *ſextus* the ſixth; becauſe that Year the Sixth of the Calends of *March*, viz. *Feb.* 24. was twice reckon'd, making that Month to contain 29 Days, which otherwiſe is never but 28, and which Year is vulgarly called *Leap-Year*.

The Mean Motion of the Sun for one Day is $59' 8'' 19''' 45'''' 54'''''$, from which ſubtracting $57' 19'' 2''' 57'''' 54'''''$, the Quantity falling ſhort every 4th or Leap-Year above the Difference will be $1' 49'' 16''' 48''''$. Therefore, by the Intercalation of the ſaid Day (and conſequently of its Motion) the Sun will every Biſſextile or Leap-Year, according to his Mean Motion, be advanced the ſaid Difference beyond the Equinoctial Point *Aries*, from whence he firſt ſet out, *viz.* the ſaid Equinoctial Point will be ſo much anticipated, which, in 33 Leap, or 132 Years, amounts to 23 min. 31 ſec. of Time above a Day.

Hence are deduced the following Rules, *viz.*

1. As every Fourth Year is a Leap-Year, the Number of Years between any and the next preceding or ſubſequent Leap-Year, can never exceed 3.

2. Therefore, dividing the Number of Years from any aſſigned Leap-Year by 4, the Quotient gives the Number of Leap-Years therefrom; and the Remainder (if any, otherwiſe 'tis Leap-Year) the Number of Years after Leap-Year.

24
60
1440

The Firſt Year of Chriſt being Leap-Year, dividing any Year thereof by 4, gives as above.

3. If to the Sun's Mean Place on any Day, *&c.* of your firſt aſſign'd Leap-Year, you add (in calculating forward) ſo many times 1′ 49″ 16‴, *&c.* (the Quantity the Sun every Fourth or Leap-Year advances forwards) as is the Quotient, or Number of Leap-Years therefrom, you will have his Mean Place accordingly; that is, if it be a Leap-Year: If not, you muſt deduct ſo many times 14′ 19″, *&c.* (the Quantity the Sun, every ſingle Year, or Year after Leap-Year, falls ſhort) from the Mean Place before found, as is the Remainder, or Years after Leap-Year. And thus will be obtained the Mean Place of the Sun for the Time required.

On theſe Principles the Table of the Sun's Mean Motions for Leap-Years is conſtructed; and the Radical Year I have made 1736, all the Mean Places and Anomalies being alſo calculated for every Day at Noon, in the reſpective Months of the ſaid Year.

The reſpective Anomalies likewiſe in the ſaid Table for Leap-Years, are, with its proper Numbers, conſtructed on the ſame Principles as the Sun's Mean Motions, *viz.* As the Motion or Place of the Apoge, being ſubtracted from the Mean Place or Longitude, always gives the Mean Anomaly, if from the aforeſaid Mean Motion of the Longitude every Leap Year, *viz.* 1′ 49″ 16‴, *&c.* be ſubtracted, 4′ 2″ 40‴, *&c.* the Motion of the Apoge for the ſame time, you will have 2′ 13″ 16‴, *&c.* negative, *viz.* the Mean Anomaly will every 4 Years forward decreaſe that Quantity; the ſame Method is obſerv'd with all the other Mean Longitudes, *&c.* in the ſaid Table.

In the ſaid Table, againſt Unity, or 1, as a Quotient, you have the aforeſaid 1′ 49″, *&c.* to be added (for any Time forward) to the Radical Mean Place of the Sun; as alſo *2′ 13″, *&c.* to be ſubtracted from the Radical Mean Place of the Anomaly, and ſo on; the Numbers againſt each reſpective Quotient being ſuch Multiples of theſe, as the ſaid Quotient is of Unity.

Therefore, when the Number of Years from the *Radix* are divided by 4, againſt the Quotient in the ſaid Table, you have the Numbers under the Mean Motion to be added (in calculating forward) as above-mentioned, and under the Mean Anomaly to be ſubtracted fro the Radical Mean Places of any aſſigned Da of the Month, Hour, *&c.* in the Year 1736 which reduces the ſame to the Places on the ſa Day of the Month, Hour, *&c.* for the Year requir'd; that is, if, as before obſerv'd, it be Lea Year: Otherwiſe, ſeek the Remainder, or Yea after Leap Year, at the Bottom of the Table againſt which, the Numbers in both Caſes (they always muſt be) being † ſubtracted fro th thoſe found, as above, give the Places of the *Mean Motion*, and *Anomaly* requir'd.

---

* The Numbers in that Caſe anſwering likewiſe to 4 Years.

† *Vide* Rule 3.

As, what farther is requiſite to be ſaid on this Head, will occur in Examples (which ſerve beſt to illuſtrate things of this nature;) I ſhall next proceed thereto; by which, the Eaſe and Conciſeneſs of the Operations will alſo more evidently appear.

And here it muſt be obſerv'd, that in all Aſtronomical Calculations, the Day is made to begin and end at Noon; and any time between the Noon of one Day, and that of the ſucceeding, is call'd, ſo many Hours, Minutes, &c. *P. M.* viz. *poſt Meridiem*, or *after Noon* of the preceding Day: Or, if the Hours, &c. ſhould extend to the Forenoon of the ſucceeding Day, by ſubtracting 'em from 24, the Remainder will be ſo many Hours, &c. *A. M.* viz *ante Meridiem*, or *before Noon* of the ſaid ſucceeding Day.

EXAMALE.

Let it be requir'd, to calculate the Place of the Sun, *Aug.* 4. at Noon, 1738.

In the Table of the *Radical Mean Places of the Sun*, and Anomaly for each Day at Noon, in the Year 1736, take out the Numbers anſwering to *Aug.* 4, viz. 4 Signs, 24 Degrees, 7 Minutes, and 40 Seconds, for the Sun's Mean Place; and 1 Sign, 15 Degr. 52 Min. and 31 Sec. for his Anomaly.

Next, to reduce this to the Time requir'd, the Number of Years from the *Radix* are but 2, and in this ſenſe, not capable of being divided by 4; therefore come under the Denomination of Remainders, or Years from Leap-Year; againſt which, as ſuch, the Numbers both for the Sun's *Mean Place* and *Anomaly*, viz. 28 Min. 39 Sec. and [illegible] Sec [illegible] to the Rule, ſubtracted from the aforeſaid *Mean Places* of the Sun and *Anomaly*, give thoſe for the time requir'd, *viz.* 4 Signs, 23 Degr. 39 Min. and 1 Sec. the Sun's *Mean Place*; and 1 Sign. 15 Degr. 21 Min. and 50 Sec. his *Anomaly*.

NEXT, To obtain the Sun's True Place for the ſaid Time, enter the *Table of the Equation of the Sun's Centre*, with the Sun's *Mean Anomaly* thus found; and in the Column, under the Sign, and againſt the Degree, on the left hand ſide, if the Sign you enter with be found at the Head of the Table; or on the right hand ſide, if at the Bottom thereof, and you will have an Equation; which added to, or ſubtracted from the aforefound *Mean Place* of the Sun, according as the Table directs, gives his True Place requir'd, according to *Equal* or *Mean Time*.

BUT it ſeldom happening, that you have an exact Degree to enter the Table of the ſaid Equation with (or indeed, any other) the Method of proportioning in ſuch Caſes is as follows.

IN the preſent Example, the Sun's *Anomaly* is ſound to be 1 Sign, 15 Degr. 21 Min. and 50 Sec. which 21 Min. 50 Sec. muſt be proportion'd for thus: In the *Table of the Equation of the Sun's entre*, Againſt 1 Sign, 15 Degr. you have 1 Degr. 21 Min. 3 Sec. and againſt 1 Sign, 16 Degr. is 1 Degr. 22 Min. 28 Sec. The difference, which is increaſing, is 1 Min. 25 Sec. or 85 Seconds; the 21 Min. 50 Sec. to be proportion'd for, being reduc'd to the Decimal Fraction of a Degree, or taken out of the Table, is .3638; and the Proportion, as $1^{\circ} : 85'' :: .3638 : 30.9308$; which being made 31, with the Fractional Part, it being nearly ſo; and added (as it was an Increaſe) to 1 Deg. 21 Min. 3 Sec. found againſt 1 Sign, 15 Deg. of *Anomaly*, makes 1 Deg. 21 Min. 34 Sec. The which, as the Table directs, being ſubtracted from the aforeſaid *Mean Place* of the Sun, gives * 4 Signs, 22 Deg. 17 Min. 27 Sec., and the *True* *Place* of the Sun requir'd, *viz.* according to Mean or Equal Time.

* ♌ *Vide* p. 1.

But if his Place be requir'd at Noon according to Apparent Time, which is that exhibited by a True *Sun-Dial*, there muſt then, from the Tables of Equation of Time, depending on his Place, and alſo on his *Anomaly*, be taken out the Numbers anſwering to each; when, if both are to be added, or both to be ſubtracted, their Sum being accordingly added or ſubtracted, to, or from the aforeſaid Apparent Time (*viz.* at Noon) gives what it is then, Equal Time: But if one is to be added, and the other ſubtracted, their difference muſt then be added or ſubtracted, according as was to be the greater of the two Equations; which will give the Equal Time, as before.

In the preſent Example, the Equation anſwering to the Anomaly, (*viz.* 1 Sign, 15 Deg. 21 Min. and 50 Sec.) is 5 Min. 26 Sec. to be ſubtracted, and to his Place (*viz.* 4 Signs, 22 Deg. 17 Min. 27 Sec.) 9 Min. 28 Sec. *fere* to be added: Their difference therefore, 4 Min. 2 Sec. as the greater of theſe two Equations was to be added, muſt therefore be added (otherwiſe it muſt have been ſubtracted) to Noon Apparent Time; which gives what it is then, Equal Time, *viz.* when it is Noon, Apparent Time, it will be 4 Min. 2 Sec. after, Mean or Equal Time.

An Equation therefore for the ſaid 4 Min. 2 Sec. muſt be obtain'd, in order to reduce the aforeſaid Place of the Sun, found according to Equal Time, to that agreeing with Apparent Time. Thus,

In the *Table of the true Horary Motion of the Sun*, againſt his preſent Anomaly, you will find his true Horary Motion to be 2 Min. 24 Sec. Whence the Proportion is, As 1 H. 2′.4 :: *.0677 : .1613, or 10 Sec. *feré*; which, as the ſaid Equation of Time was added, muſt therefore be added to the aforeſaid Place of the Sun at Noon, Equal Time; which gives 4 Signs, 22 Deg. 17 Min. 37 Sec. the Sun's True Place at Noon, according to Apparent Time.

* *Decimal* 4′ 2″.

Again, If at Noon Equal Time, for which the Sun's Place was at firſt calculated, it had been requir'd, what it was then Apparent; by ſubtracting the aforeſaid Equation, *viz.* 4 Min. 2 Sec. therefrom, the difference, 55 Min. 58 Sec. after 11 in the Forenoon, gives the Anſwer, for the Equation of Time, ſerving to reduce the Apparent to the Mean, or Equal; it is obvious, that if to 55 Min. 58 Sec. after Eleven in the Forenoon, the now Apparent Time, you add the aforeſaid Equation of Time, *viz.* 4 Min. 2 Sec. it will give Noon Equal Time, as at firſt.

Which gives this General Rule, *viz.* When the Equation of Time is Affirmative, or to be added, ſubtract it from the Equal Time, and you have the Apparent: And contrarily, when it is to ſubtracted, by adding it to the Equal, you will alſo have the Apparent.

Laſtly, To obtain the Place of the Sun's *Apogé*.

FROM the Mean Place of the Sun before und, ſubtract that of the Anomaly ; the difference the Place of the *Apogé* requir'd.

IN the preſent Example, the Anomaly, 1 Sign, 5 Deg. 21 Min. and 50 Sec. being ſubtracted from e Sun's Mean Place, *viz.* 4 Signs, 23 Deg. 39 in and 1 Sec. gives 3 Signs, 8 Deg. 17 Min. and 1 Sec. for Anſwer.

* * *

TABLATURE *of the Whole* CALCULUS.

qual Time	☉ s Me.*Lon.*				☉'s *Me.Ano.*				
	S.	°	′	″	S.	°	′	″	
736. *Auguſt* 4.	4	24	7	40	1	15	52	31	
Year à Rad. *—			28	39			30	41	—
738. *Auguſt* 4.	4	23	39	1	1	15	21	50	Subt. from
q. ☉'s Cent. —		1	21	34	4	23	39	1	☉'s *Me.Pla*
'sTr.Pl. Eq. Ti.	4	22	17	27	3	8	17	11	☉'s Apogé.
orEqn. Time +				10					
's Tr.Pl. Ap.Ti.	4	22	17	37					

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* This Character —, is call'd *leſs*, and ſignifies, that Numbers following it, or againſt which it is placed, to be ſubtracted.

THE

1869
1736
133
33-1

The Months of *January* and *February* onl
beſides the General Rule, require this particul
regard, *viz.* When it is not Leap-Year, there mu
then be added, the Motion of a Day, to the r
ſpective *Mean Places*, &c. That is, if you requi
the *Mean Place* of the Sun, &c. on the Firſt Da
of the Month, you muſt take the Numbers a
ſwering to the Second Day, &c. But when it
Leap-Year, they come under the General Ru
of the other Months.

The Reaſon is, the Radical Year 1736, whic
is Leap-Year, conſiſts of 366 Days; the Additio
of which Day (and conſequently, of its Motio
did not abſolutely commence till the 29*th* Day o
February; whence it was taken into the Accou
every following Month of the Year; and mu
therefore be continu'd on to the Place of i
Commencement, *viz.* the *January* and *Februa*
of the Year following, &c.

Next, The reaſon why every Leap-Year 'i
not regarded, is, becauſe every ſingle Year, or Ye
after Leap-Year, there is deducted by the Ru
14 min. 19 ſec. 43 thirds, and 20 fourths; t
ſame as before, amounting in four Years, to 5
min. 18 ſec. 53 thirds, and 20 fourths; whic
being deducted from the Motion of a Day, leav
1 min. 49 ſec. 16 thirds, and 28 fourths, th
Quantity requir'd every Leap-Year to be added
which being therefore added to the *Mean Plac*
of *January* and *February*, every Leap-Year, as i
the other Months, gives the *Mean Places* accor
ingly: From which Reaſon, the above Rule
very plain.

EX

EXAMPLE II.

LET it be requir'd, to calculate the Sun's Place r the Year of Chriſt 1761, *January* the Firſt at oon.

FIRST, Deducting 1736, from 1761, and the ſidue 25, the Years from the Radix being di- ded by 4, gives 6 for the Quote, and 1, the Re- ainder, *viz.* One Year after Leap-Year.

NEXT, As it is not Leap-Year, and the Month *nuary*, wherein you are calculating the Sun's ace; in the Radical Year 1736, take out the umbers for the Sun's Mean Place, and Anomaly, ainſt the Second of *January*; which in this caſe, the Rule, will in the Year requir'd, as not being ap-Year, anſwer to the Firſt; which you will d, as in the *Tab'lature*.

THEN againſt 6, the Quotient, in the *Table the Sun's Mean Motion and Anomaly*, you have min. 55 ſec. and 39 thirds, anſwering to his ean Motion; and 13 min. 20 ſec. to his Ano- aly; which 10 min. 55 ſec. and 39 thirds, by e Rule is to be added; but at the ſame time, . min. 19 ſec. and 43 thirds, againſt 1, the mainder, is to be ſubtracted. The Difference erefore, which is Negative (*viz.* 3 min. 24 ſec.) ing ſubtracted from the Numbers taken out *nuary* the 2*d*, as above, gives the Mean Place the Sun requir'd*. But with the Anomaly it otherwiſe, as having a regreſſive Motion: herefore the Numbers found againſt the Quote ere (*viz.* 13 min. 20 ſec.) as alſo againſt 1, the mainder (*viz.* 15 min. 20 ſec.) are both to be btracted. Their Sum therefore (*viz.* 28 min. 40 ſec.)

* *Vide* Tab'lature.

40 ſec.) being taken from the aforeſaid Anomal on *January* the 2*d*, &c. gives you the Anomal requir'd: And thus, their Mean Places for th Firſt of *January*, 1761, are compleated *.

* *Vide* Tab'lature.

NEXT, for the Sun's True Place.

IN the *Table of the Equation* of his *Centr* againſt 6 Signs, 13 Deg. Anomaly (as in th *Tab'lature)* you find 26 min. 42 ſec. and again 6 Signs, 14 Deg. are 28 min. 43 ſec. The Di ference is, 2 min. 1 ſec. or 121 ſeconds: Th Decimal Fraction of 30 min. 11 ſec. (the Exc of the Anomaly, above 6 Signs, 13 Deg.) is .50 *&c.* The Proportion will be, As 1 : 121 :: 50 : 61″ *fere*: Which, as it was an Increaſe, bei added to 36 min. 42 ſee. gives 27 min. 43 ſe which, as the Table directs, being added to t Sun's Mean Place before found, gives his Tru and by following the Precepts to the precedi Example, you will find alſo the Equation of Tim Apparent Time, likewiſe the Place of the Apo to be as in the *Tab'lature* following.

TABL

* * *

TAB'LATURE *of the* CALCULUS.

Equal Time.	☉ *Me. Long.*	☉ *Anomaly*	
1736. *January* 2.	9S:22°13′25″	6S.13°58′51″	
+ 25 Year, &c.	3 24	28 40	
1761. *January* 1.	9 22 10 1	6 13 30 11	Subt. from
Eq. ☉ Centre	27 43	9 22 10 11	☉ *Me. Place.*
☉ Tr. Pl. Eq. Ti.	9 22 37 44	3 8 40 00	☉ Apogé
Eqn. Ti. +1′ 51″	Depending on ☉ *Anomaly.*		
Ditto +7 15	Depending on ☉ Place.		
+9 6	50′ 54″ aft. 11 Morn. *Apparent Time.*		

THESE Examples contain all that is requiſite in calculating the Place of the *Sun*, for any time forward, or to come. I ſhall next proceed to Examples, in calculating the ſame, for any time paſt, or backward.

AS before, in calculating forward, ſo here, for the like backward. The Number of Years from the *Radix* (*viz.* 1736,) muſt be divided by 4, and the Remainder, if any, will now be ſo many Years towards the preceding *Leap-Year*; which therefore being ſubtracted from 4, gives the Number of Years from, or after the ſaid preceding *Leap-Year*; to which (when the Year you calculate for, happens not to be Leap-Year) you muſt always go back with the aforeſaid Quotient; which is ever done, by adding Unity thereto: With whic Numbers, as now prepar'd, you muſt enter th Table of the *Sun's Mean Motion and Anomaly*, a before, in calculating forward.

BUT the Numbers againſt the new prepar' Quotient, are to be us'd contrarily, *viz.* Thoſe fo the Sun's Mean Place, which before were to b added, muſt now be ſubtracted; and thoſe for th Anomaly, which in the former Caſe, were to b ſubtracted, muſt in this be added: But tho againſt the prepar'd Remainder, as in calculatin forward, muſt in both Caſes be always ſubtracted

FROM a due Conſideration of the precedin Principles, the Reaſon of the Method in th regreſſive *Calculus* will be very plain and obviou

I ſhall next proceed to the Illuſtration there by Examples.

EXAMPLE I.

LET the Place of the Sun at Noon, *Januar* the Firſt, 1729, be requir'd.

THE Number of Years from the *Radix* (vi 1736,) by ſubtracting 1729 therefrom, will b found to be 7; which divided by 4, gives 1 fo the Quotient, and 3 for the Remainder: Where fore, as it is not Leap-Year, ſubtracting the ſai Remainder from 4, the Difference, Unity, ſhew it to be One Year from, or after the precedin Leap-Year; which Difference being alſo ſubtracte from the ſaid Year, *viz.* 1729, gives 1728, for th Leap Year preceding; and conſequently, 172 will be the Year after, as above, &c.

NEXT, According to the Rule, by adding Unity, *viz.* 1, to the aforeſaid Quotient, you have 2 to be operated with, as if it had been the real Quotient, and 1, the Difference (of the Remainder from 4) as if it had been alſo the real Remainder, and your *Calculation forward*, which, in reſpect to to the Year 1728 (to which Year, by the above Method, it is reduc'd) it really is: For againſt 2 (the now Quotient, and alſo Number of Leap-Years from 1736, back) in the *Table of the Sun's Mean Motion*, you have $3' \; 38'' \; 33'''$; which, if it were added to the *Radix* of the Year 1728, would by the Rule, in calculating forward, give that for 1736; and conſequently, by ſubtracting the ſame from the *Radix* of 1736, you will have that for 1728: But then, as there is one Year advanc'd from the ſaid Leap Year 1728, the Numbers againſt the ſame, as a Remainder, muſt be ſubtracted from the Mean Motion of the Sun for * 1728, thus found; both which Sums therefore, being ſubtracted from the Radical Mean Place of the Sun, 1736, for the ſaid Month, Day, &c. with that requir'd, gives the Mean Place of the Sun for the ſame Time in the Year requir'd.

* *From which Year you now reckon forward.*

AGAIN, As the Numbers for the Anomaly in calculating forward, againſt the ſaid Quotient, is to be ſubtracted, 'tis plain, the Number found againſt 2, the now Quotient, muſt have been ſubtracted from thoſe anſwering to the Year 1728, to have obtain'd the ſame for 1736; and conſequently, by adding them to the Radicals 1736, you will have thoſe for 1728. But the Numbers againſt 1, for the Year after Leap-Year, muſt, as before, be always ſubtracted. The Difference therefore, being added to, or ſubtracted from the

Radical Anomaly 1736,&c. gives (as above, in the Mean Place of the Sun) the Anomaly for the Time requir'd.

If the Number for the Anomaly againſt the Remainder is greater than thoſe againſt the Quotient, the Difference is to be ſubtracted; otherwiſe, added.

The Regreſſive Method being evidently clear'd up, I ſhall proceed, with finiſhing the *Calculus*.

As the Month for which the *Sun's Place* is requir'd, is *January* the Firſt Day, at Noon, and the Year no being Leap-Year, the *Mean Motions* anſwering to the Second Day in the *Radix*, muſt be taken, *viz.* thoſe for the Mean Place, being 9 Signs, 22 deg. 13 min. and 25 ſec. and thoſe for the Anomaly, 6 Signs, 13 deg. 58 min. and 51 ſec. The Numbers againſt 2, the now Quotient, are 3 min. 38 ſec. and 33 thirds, for the Sun's Mean Place, and are to be ſubtracted: Then againſt 1, the Remainder, are 14 min. 19 ſec. and 43 thirds alſo to be ſubtracted: Their Sum therefore, *viz.* 17 min. 58 ſec. being ſubtracted from the Radical Mean Place, as above, gives 9 Signs, 21 deg. 55 min. and 27 ſec. Sun's Mean Place for the Time requir'd.

Next, for the Anomaly, the Numbers anſwering to 2, the Quotient, are 4 min. 27 ſec. to be added; but thoſe againſt the 1, Remainder, or Year from Leap-Year, 15 min. 20 ſec. to be ſubtracted, their Difference, *viz.* 10 min. 53 ſec. being ſubtracted from the *Radical Anomaly* as above, gives 6 Signs, 13 deg. 47 min. and 58 ſec. the Anomaly alſo for the Time requir'd: Proceeding as in the preceding Examples, the True Place, &c. will be as in the following *Tab'lature*; to which is alſo added, that for the Second Day of the ſaid Month and Year.

* * *

TABLATURE *of the* CALCULUS.

Equal Time	☉ Me. Lon. S. ° ' "	☉ Anomaly. S. ° ' "	
1736, *January* 2.	9 22 13 25	6 13 58 51	
— 7 Ye. à Rad.	17 58	10 53	
1729, *January* 1.	9 21 55 27	6 13 47 58	Subt. from
Eqn. ☉ Cent. +	28 19	9 21 55 27	☉ Me.Place
☉ Tr. Pl. Eq. Ti.	9 22 23 46	3 8 7 29	☉ Apogé.
Eq.Time + 1' 53"	Depending on ☉ Anomaly.		
Ditto + 7 9	*Ditto* ——— Place.		
+ 9 2	50' 58" after 11 Morn. *Apparent Time.*		

Equal Time.	☉ Me. Lon. S. ° ' "	☉ Anomaly. S. ° ' "	
1736, *January* 3.	9 23 12 33	6 14 57 59	
— 7 Ye. à Rad.	17 58	10 53	
1729, *January* 2.	9 22 54 35	6 14 47 6	Subt. from
Eqn. ☉ Cent. +	30 17	9 22 54 35	☉ Me.Place
☉ Tr.Pl. Eq. Ti.	9 23 24 42	3 8 7 29	☉ Apogé.
Eq.Time + 2' 0"	Depending on ☉ Anomaly.		
Ditto + 7 26	*Ditto* ——— Place.		
9 26	50' 34" after 11 Morn. *Apparent Time.*		

It will be neceſſary for thoſe who calculat the Sun's Place for any Series of Time, always t find the Place of the *Apoge* ; which, if it continu the ſame the whole Year, it will be a Proof tha the Work is ſo far right.

EXAMPLE II.

Let the Mean Place and Anomaly be requir'd the Laſt Day of *December* at Noon, preceding th Firſt Year of the Chriſtian *Æra*, at which tim the ſaid Year ends, and the Enſuing commences, in Aſtronomical Calculations.

First, Subtract 1 from the Radical Yea 1736 ; the Remainder, 1735, (Years to go bac to) being divided by 4, gives 433 for the Quoti-ent, and 3, the Remainder. Therefore, as it i not Leap-Year, according to the Rule, adding Unity to the Quotient, makes 434 ; and ſubtract-ing 3, the Remainder from 4, gives 1, *viz.* One Year after Leap-Year (wherefore the Year o Chriſt's Nativity was Leap-Year ;) and thus you Numbers are prepar'd for Operation.

TA-

In Table of Me. Mo. and Ano. every 4th or Leap Year.											Rad. Me. Pl. ⊙ and Anom. Jan. 1, 1736.								
		Mean Motion.					Mean Anomaly				Mean Place.					Mean Anomaly.			
		s	°	'	"	'''	s	°	'	"	s	°	'	"	'''	s	°	'	"
Againſt	400	0	12	8	32	32	0	14	49	15	9	21	14	15	54	6	12	59	43
	30	0	0	54	38	26	0	1	6	42									
	4	0	0	7	17	8	0	0	8	54									
	434		—13	10	28	6		+16	4	51									
For 1 new-Rem.				—14	19	43			—15	20									
			—13	24	47	49		+15	49	31		—13	24	47	49		+15	49	31
Mean Places of Ano.* Dec. 31. at Noon, 1ſt Ye. Xt.											9	7	49	28	5	6	28	49	14
											Rad. Me. Pl. ⊙ and Anom. Dec. 31. 1736.								
											9	20	59	56	11	6	12	44	23
												—13	10	28	6		+16	4	51
											9	7	49	28	5	6	28	49	14

Or, if the Radical Places on the laſt of *Dec.* 1736. be taken, there will be then 1736 Years to go back, and 434 be the exact Quote, when divided by 4, the Numbers anſwering to which, as above, being applied in like manner, gives the Anſwer as before, *&c.*

In the firſt Caſe, *Jan.* 1. 1736 Years was gone back to, which being Leap-Year, conſiſted of 366 Days, but to *Dec.* 31. following are only 365, in which Time the Sun falls ſhort 14 Minutes, 19 Seconds, 43 Thirds of one Revolution, as may be found by ſubtracting the Mean Place on *Dec.* 31. from that on *Jan.* 1. in the Radical Year 1736, which, anſwering to 1, the Remainder, as above, is therefore, as by the Rule, deducted to give the Mean Place, as required, *&c.*

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* See p. 110.

By applying the ſame Numbers to the Mean Places on any other reſpective Radical Month and Day of the Year 1736, you will have the Mean Places for the ſaid Month and Day, in the Firſt Year of Chriſt accordingly.

In theſe Examples, the Mean Places at the Noon of the Day only have hitherto been conſidered: But if it be required for any Hour or Minute, &c. of the ſaid Day, you muſt calculate the *Mean Places* for the ſaid Day, Hour, Minute, &c. in the Radical Year 1736; when the Numbers requiſite before, to reduce them from the Noon of the ſaid Day, to that of the ſame Day of the Month in any other Year required, will reduce this laſt *Calculus* alſo, to the ſame Day of the Month, Hour, &c. in the Year required, as was the ſaid *Calculus* in the Radical Year.

EXAMPLE.

LET it be requir'd, to calculate the Place of he Sun, on *December* 12, 1738, at 5 h. 27 min. . *M.* or *Afternoon.*

TABLATURE.

qual Time.	⊙ Me. Long.					⊙ Me. Ano.				
	S.	°	′	″	‴	S.	°	′	″	
736, *Decemb.* 12	9	2	15	21	6	9	23	59	51	
Hour 5 +			12	19	0			12	19	
Min. 27 +			1	6	32			1	7	
	9	2	28	46	38	5	24	13	17	
Year à Rad. —			28	39	27			30	41	
738, *Dec.* 12, &c.	9	2	0	7	11	5	23	42	36	Subtr. from
qn. ⊙ Cent. —			13			9	2	0	7	⊙ Me. Place.
True Place	9	1	47	7	11	3	8	17	31	⊙ Apoge.
qu. Time —	0′ 52″ depending on ⊙ Anomaly.									
itto - - - +	0 38 *ditto* — — — Place.									
—	0 14, *viz.* 5 Ho. 27′ 14″ Apparent Time.									

In this Example, the Thirds are made uſe of, which, in the End, if under 30 (as before ob-ſerv'd) may be neglected: if above 30, the Seconds are made One more for them, &c. but in the Anomaly, they are altogether neglected, being there of no moment.

Thus, having given Examples in all Caſes requiſite for determining the Place of the Sun, I ſhall next proceed to thoſe for the Moon, from theſe New Tables, digeſted according to Sir Iſa *Newton*'s Theory.

The Principles on which the Tables of th *Mean Motion of the Moon*, the *Apoge* and *Node*, ar built, are the ſame with thoſe of the Sun.

It is to be obſerv'd, that the Numbers her againſt the Remainders, or Years after Leap-Yea are always to be added, excepting in the Node which, like the Anomaly of the Sun, has a regre ſive Motion.

The Reaſon is, that in a common Year o 365 Days, the Moon, ſuppoſing her (as before o the Sun) in the firſt Point of *Aries*, will, by he Mean Motion, over and above her Revolution have mov'd 4 Signs, 9 Deg. 23 min. and 4 ſe beyond the ſaid Point, at the Expiration of the ſa Year; which therefore muſt be added to the ſa Point, in order to obtain her Mean Place.

The Mean Motion of the Moon for fo ſingle Years, is 5 Signs, 7 Deg. 32 min. and ſec. as may be found, by adding together th Numbers againſt 3, and 1, in the Remainders but every Leap-Year having a Day more add thereto, there muſt alſo the Motion of a D e taken in, *viz.* 13° 10′ 35″; which added to the aforeſaid Four ſingle Years Motion, nake 5 S. 20° 42′ 49″, the Motion for every Leap-Year; which you find in the Table of her *Mean Motions*, &c. The like is to be underſtood f the Apoge; alſo of the Node, with regard to ts Regreſſive Motion.

As Examples beſt conduce to clear up theſe *alculi*, I ſhall, (as before of the Sun) have immediate recourſe thereto.

EXAMPLE I.

Let the Moon's Place be requir'd, *Decemb.* 12, 1738, *at* 5 ho. 27′ *P.M.*

For the Firſt Equation of the Moon.

THE Moon's Mean * Place, *Dec.* 12, 1736, at Noon, &c. is, 5 S. 14 Deg. 23 min. and 44 ec; that of the Apoge, 0 S. 1 Deg. 8 min. nd 57 ſec. and that of the Node, 5 S. 22 Deg. min. and 59 ſec.

Next, As there are two ſingle Years from he *Radix*, which are to be taken as Remainders, as before of the Sun) againſt which, as ſuch, you ave 8 S. 18 Deg. 46 min. and 7 ſec. for the Mean Motion of the Moon; 2 S. 21 Deg. 19 min. nd 41 ſec. for that of the Apoge; and 1 S. 8 Deg. 39 min. and 26 ſec. for that of the Node: The two former of which, being added to, and the atter ſubtracted from the reſpective Radicals, ive the Mean Places on the ſaid *Dec.* 12, as above, 738, viz. 2 S. 3 Deg. 9 min. and 51 ſec. Moon's Mean Place; 2 S. 22 Deg. 28 min. and 38 ſec.

* *Vide* Tab'lature *and Table for the Mean Places of* ☽, &c. *every Day of the ſaid Year.*

for the Apoge ; and 4 S. 13 Deg. 25 min. and 35 ſec. for that of the Node.

Next, With the Sun's Anomaly, entring the Tables for the First Equation, according to each reſpective *Title*, viz. *Moon*, the *Apoge* and the *Node*, operating as before, in Equating for the Sun's Centre, you wil have (as each particular Table directs) the Equation, 1 min. 18 ſec. to be added to the Moon' Mean Place ; or Longitude, 2 min. 13 ſec. t be ſubtracted from that of the Apoge ; and 1 min 3 ſec. to be added to that of the Node : And thi is call'd, the *First Equation* of each ; which no gives 2 S. 3 Deg. 11 min. and 9 ſec. the Mea Longitude, 2 S. 22 Deg. 26 min. and 25 ſec. Apoge ; and 4 S. 13 Deg. 26 min. and 8 ſec. fo the Node.

Before you can proceed any farther, th True Place of the Sun, *&c.* muſt be had fo the ſame Time with that of the Moon required ; which, indeed, is the Baſis of all ; an therefore is plac'd first, as in the *Tab'lature*.

For the Second Equation of the Moon.

Ubtract the Apoge the firſt time Equated, from the True Place of the Sun; the Difference ves the Numbers, with which you muſt Enter the *ble of the Second Equation of the Moon*; and in e ſame Column with the Sign, either at the ead or Bottom of the Table; and againſt the egree, *&c.* in the Side thereof you will have an quation; and alſo againſt the ſaid Equation, an crement, which muſt be proportion'd, as occaſion quires: All which, in this Equation, may be one, as it were, by Inſpection.

In the preſent Example, the Place of the Apoge e Firſt time Equated, is 2 S. 22 Deg. 26 min. d 25 ſec. which ſubtracted from the true Place the Sun, *viz.* 9 S. 1 Deg. 47 min. and 7 ſec. ves 6 S. 9 Deg. * 20 min. and 42 ſec. In the able, againſt 6 S. 9 Deg. are 1 min. 6 ſec. and gainſt 6 S. 10 Deg. are 1 min. 13 ſec. Their ifference is 7 ſec. a proportional Part of which uſt be taken for the 20 min. 42 ſeconds, above S. 9 Deg. which being about one third Part a Degree, therefore one third Part of 7 ſe- nds (which let be 2 ſeconds) muſt be added s it was an Increaſe) to 1 min. 6 ſec. which akes 1 min. 8 ſec.

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* *The Diſtance being often made uſe of in the Calculus, the utes and Seconds thereof being reduced to an exact Decimal, are d in the* Tab'lature, *thereby ſaving the trouble of often ta- the ſame out of the* Table.

NEXT, The Increment againſt the ſaid 6 Sign 9 Degrees, is found to be 7 ſeconds (the Propo tioning in this Caſe, being of no moment ;) whic ſaid Increment requires alſo to be proportion thus : Firſt, in the little Table for that purpo take out the Number anſwering to the Sun's pre ſent Anomaly. Then the Proportion will alwa be, As 22, the greateſt Number in the Table, to the Number thus taken out ; ſo is the Inc ment before found, in the Firſt Table, to the p ſent Increment : Which being added to the f mer Equation, and this laſt Reſult apply'd as Table directs, to the Moon's Place, the Firſt ti Equated, gives her Place Equated the Seco time.

IN the preſent Example, the Number anſw ing the preſent Anomaly, *viz.* 5 Signs, 23 D grees, *&c.* is 22, the greateſt Number in ſaid Table ; conſequently, 7 Seconds, the Inc ment before found, will ſtill be 7 Seconds, as firſt ; the which added to the Equation at f found, *viz.* 1 min. 8 ſec. gives 1 min. 15 which, as the Table directs, being ſubtracted f the Moon's Place the firſt time Equated, 2 S. 3 Deg. 11 min. and 9 ſec. gives 2 S. 3 D 9 min. and 54 ſec. the Moon's Place the Seco time Equated.

For the Third Equation of the Moon.

SUbtract the Firſt Equated Place of the Node from that of the Sun; with the *Difference* nter the *Table of the third Equation of the Moon*; gainſt which, &c. you will have an Equation; hich apply'd, as the Table directs, to the Moon's lace the Second time Equated, gives her Place quated the Third time.

IN the *preſent Example*, the Place of the Node he Firſt time Equated, is, 4 *S.* 13 Deg. 26 min. nd 8 ſec. and that of the Sun, 9 *S.* 1 Deg. 47 in. and 7 ſec. The *Difference* is, 4 *S.* 18 Deg. 0 min. and 59 ſec. Againſt which, in the *Table or the third Equation*, are 47 ſeconds, to be ſubracted from the Moon's Place, the Second time quated, *viz.* 2 *S.* 3 Deg. 9 min. and 54 ſec. hich gives 2 *S.* 3 Deg. 9 min. and 7 ſec. for the lace of the Moon the Third time Equated.

For the Fourth Equation of the Moon.

FROM the Place of the Moon the Third time Equated ſubtract the True Place of he Sun, reſerving the Remainder.

NEXT, From the Place of the Moon's Apoge, he Firſt time Equated, ſubtract that of the Sun's poge. With the Sum of theſe two Remainders rejecting the Circle, or 12 Signs, if they exceed) Enter the *Table of the Fourth Equation of the Moon*; againſt which, &c. you will have an Equaion; which order'd as the Table directs, gives the lace of the Moon the Fourth time Equated.

In the preſent Example, the Place of the Sun, *viz.* 9 *S.* 1 Deg. 47 min. and 7 ſec. being ſubtracted from 2 *S.* 3 Deg. 9 min. and 7 ſec. th Place of the Moon the Third time Equated, gives 5 *S.* 1 Deg. 22 min. and 0 ſec.

Next, 3 *S.* 8 Deg. 17 min. and 31 ſec. the Place of the Sun's Apoge, being alſo ſubtracted from 2 *S.* 22 Deg. 26 min. and 25 ſec. the Place o the Moon's Apoge the Firſt time Equated, gives 11 S 13 Deg. 18 min. and 54 ſec. Both which Remainders, the Circle being rejected, gives 4 *S.* 15 Deg 10 min. and 54 ſec. Againſt which, in the Tabl of the *Fourth Equation of the Moon*, are, 1 min 43 ſec. to be ſubtracted from the aforeſaid Plac of the Moon, the Third time Equated, *viz.* 2 S 3 Deg. 9 min. and 7 ſec. which gives 2 *S.* 3 Deg 7 min. and 24 ſec. the Place of the Moon, the Fourth time Equated.

For the Second Equation of the Moon's Apoge.

WITH the Difference, or Diſtance of the *Apoge*, the Firſt time Equated, from the Sun, you muſt Enter the *Table of the Secon Equation of the* Apoge; againſt which, &c. proportion'd, if requiſite (and which Proportio muſt here be very acurate,) you will have a Equation, which added, or ſubtracted, as the Table directs, to, or from the Firſt Equated Place of the *Apoge*, gives the Place of the *Apoge*, the Second time Equated.

In the preſent Example, the aforeſaid Diſtance [*Vide* the *Second Equation*,] is 6 *S.* 9 Deg 20 min. and 42 ſec. The 20 min. 42 ſec. reduc'd

an

:o an exact Decimal, or taken out of the Table, is .345. Then in the *Table of the Second Equation of the Apoge*, Againſt 6 *S.* 9 Deg. are, 3 Deg. minutes; and againſt 6 *S.* 10 Deg. are, 3 Deg. 28 min. and 27 ſeconds: The Difference is, 20 nin. 27 ſeconds; the Decimal of which, taken ut of the Table, is, .34083: Whence the Proortion will be, As 1° : .341 * :: .345 : .117645; which being reduc'd, will be found to be 7 min. ſeconds *fere*; which being added to 3 Deg. minutes, againſt 6 Deg. 9 minutes, &c. (as the ame was increaſing) gives 3 Deg. 15 min. and ſec. for the Second Equation of the *Apoge*; which added, as the Table directs, to the *Apoge*, the Firſt time Equated, *viz.* 2 *S.* 22 Deg. 6 min. and 25 ſec. gives 2 *S.* 25 Deg. 41 min. nd 28 ſec. for the Place of the *Apoge*, the Second ime Equated.

* V. P. 95.

For the Mean Anomaly of the Moon.

FROM the Place of the Moon the Fourth time Equated, ſubtract the Place of the Ioon's *Apoge*, the Second time Equated; the emainder is the Mean Anomaly of the Moon ught.

IN the preſent Example, the Place of the Ioon the Fourth time Equated, is, 2 *S.* 3 Deg. min. and 24 ſeconds; from which ſubtracting *S.* 25 Deg. 41 min. and 28 ſeconds, the Place of e Moon's Apoge, the Second time Equated, the emainder, *viz.* 11 *S.* 7 Deg. 25 min. and 56 ſeconds, is the Mean Anomaly of the Moo ſought.

For the Elliptic Equation of the Moon.

WITH the Mean Anomaly of the Moon, enter the Table, titled, *The Mean Elliptic Equation* thereof; from which take out the Numbers anſwering to the ſaid Mean Anomaly; which Numbers will be the Mean Elliptic Equation ſought.

NEXT, The aforeſaid Diſtance of the Moon's Apoge the Firſt time Equated, from the Sun, muſt be prepar'd in the manner following, *viz.*

LET the ſame, if under 3 Signs, &c. be reduc'd to Degrees, which will then be prepar'd accordingly.

IF the ſame be above 3, and under 6 Signs, ſubtract it from 6 Signs; the Remainder reduc'd to Degrees, will alſo be accordingly prepar'd.

IF it exceeds 6 Signs, ſubtract 6 Signs therefrom. The Remainder, being order'd according to one of the two former Precepts, as requiſite, gives the prepar'd Degrees, &c. requir'd.

LASTLY, With the Mean Anomaly, enter the Table, titled, *The Reduction of the Mean Elliptic, to the True Elliptic Equation of the Moon.*

WHEN in the Column anſwering to the ſaid Mean Anomaly, and againſt the aforeſaid prepar'd Number in the Margins, or outer Colum

eithe

either to the right or left hand, you have an Equation ; which added to, or ſubtracted from the Mean Elliptic Equation before found, gives the True Elliptic Equation requir'd.

In the preſent Example, the Mean Anomaly of the Moon is, 11 S. 7 Deg. 25 min. and 56 ſec. In the Table of the *Mean Elliptic Equation*, againſt 11 S. 7 Deg. are 2, Deg. 20 min. and 44 ſeconds ; and againſt 11 S. 8 Deg. are, 2 Deg. 14 min. and 53 ſec. The Difference is, 5 min. 51 ſec. or 351 ſeconds.

Next, The Decimal of 25′ 56″ is, .432 ; which multiply'd by 351″, gives 152″ *ferè*, viz. 2′ 32″, to be ſubtracted (as the ſaid Equation was decreaſing) from 2 Deg. 20 min. and 44 ſec. againſt 11 S. 7 Deg. of Anomaly ; which gives 2°. 18′ 12″ Mean Elliptic Equation, to be added, as the Table directs, to the Fourth Equated Place of the Moon ; But, (as before) there is requir'd a Proſthaphereſis for the Reduction of this Mean to the True Elliptic Equation requir'd, to be obtain'd, thus :

In the preſent Example, the Diſtance of the Moon's Apoge, *&c.* from the Sun (6 Signs, as before noted, being rejected) is, 9 Deg. 20 min. and 42 ſec. and the Mean Anomaly as before, 11 S. 7 Deg. 25 min. and 56 ſec. In the Table for the *Reduction of the Mean Eliptic Equation*, &c. to the True, againſt 8, the next leſs Marginal Number to the prepar'd Degree, and in the Column of 11 S. 6 Deg. the next leſs Degree alſo of the Mean Anomaly, you have 25 min. 56 ſec. alſo againſt 10, the next greater Marginal Number to the prepar'd Degree in the Column of the ſaid 11 S. 6 Deg. of Anomaly, you have 25 min. 26 ſec. The Difference of theſe two is 30 ſec. and the Decimal of 20′ 42″ belonging to the prepar'd Number, out of the Tabl &c. is .345; the Proportion will therefore be, As 2 the Difference between 8 and 10 (the outer, o Marginal Numbers) is to 30″, (the Difference o the Numbers anſwering to the ſaid Marginal Numbers, &c.) ſo is 1°.345, (the Difference between th leſſer Marginal Number, and the true prepar' Number, &c.) to 20″; which ſubtracted fro 25 min. 56 ſec. gives 25 min. 36 ſec. the tru Equation anſwering to 11 S. 6 Deg. Anomaly and 9 Deg. 20 min. and 42 ſec. the true prepar' Number, as before.

NEXT, As the Mean Anomaly in the preſen Example, is, 11 S. 7 Deg. 25 min. and 56 ſec. th ſame Proportions as before, muſt be made wit the next greater Anomaly, *viz.* 11 S. 9 Deg. the Table being calculated to every 3 Degrees of Anomaly; and thus, againſt 11 S. 9 Deg. and alſ againſt 8 (as before, &c.) is 22 min. 45 ſec. and at the ſame time, againſt 10, is 22 min. 17 ſec Their Difference is 28 ſec. when the Proportion (as before, &c.) will be, As 2° : 28″ :: 1°.345 : 18.83, or 19″; which being ſubtracted, for the above reaſon, from 22 min. 45 ſec. gives 22 min. 26 ſec. for the True Equation, at 11 S. 9 Deg. o Anomaly.

LASTLY, The Difference of theſe two laſt Equations is 3′ 10″, or 190″ decreaſing, *viz.* in Three Degrees of Anomaly, from 11 S. 6 Deg. to 11 S. 9 Deg. But the Mean Anomaly in the preſent Example, is, 11 S. 7 Deg. 25 min. and 56 ſec. The Difference between which, and the next leſſer in the *Table of Reduction*, &c. is 1 Deg. 25 min. and 56 ſec. The Decimal of 25′ 56″ is .432

Where-

herefore,the Proportion will be, If 3 Degrees of
nomaly decreaſe 190 Seconds, what will 1.437
creaſe? Which will be found to be 90 Seconds,
1 Minute, 30 Seconds; which ſubtracted,
it was a Decreaſe, from 25 min. 36 ſec. before
und, gives 24 min. 6 ſec. to be added, as the
able directs, to the aforefound Mean Elliptic E-
ation, *viz.* 2 Deg. 18 min. and 12 ſec. which
ves 2 Deg. 42 min. and 18 ſec. the true El-
tic Equation requir'd; which, according as the
able of the *Mean Elliptic Equation* before direct-
l, being added to the Place of the Moon the
ourth time Equated, *viz.* 2 S. 3 Deg. 7 min. and
ſec. gives 2 S. 5 Deg. 49 min. and 42 ſec. for
e Place of the Moon the Fifth time Equa-
d.

It may be obſerv'd, that theſe Equations be-
g minute, their Proportions appear almoſt at
ght: For the Marginal Number differing always
2, half of either the Second or Third Term
the Proportion, multiply'd into the other, gives
e Anſwer, &c. [*Vide* the following *Tablet.*]

T A B L E T.

Diſt. Apo. ☽ Ti. Equated à ☉ 9°.27	*Me. Ano.* ☽ 11 S. 6°	*Me. Ano.* ☽ 11 S. 9°
	° ′ ″	° ′ ″
Marginal Numbers } 8	0 25 56	0 22 45
Marginal Numbers } 10	0 25 26	0 22 17
Differences	30	28
Diff tr. Diſt. ☽ *Ap.* 1°. *Ti. Eqd.* à ☉ and leſſ. Marg. Numb. Half aforeſaid Differences	1.345 (*Mult.*) 15	1.345 (*Mult.*) 14
Equations ſubtract — —	20″	19″
Eqns. tr. Diſt. Apo. ☽ à ☉	0 25 36	0 22 26
Diff. ditto *to gr. and leſſ. Ano.*	3′ 10′	or 190″
Diff. tr. and leſſ. Anom.	1.432$\frac{1}{3}$ *dit.* *Multip. by*	.4774 190
25′ 36″ leſs 1′ 30″ gives	Tr. Equat. + 24 6	90*

* The Decimal in this Equation is omitted, that the Mean Anomaly being made an Unit; which is m of Curioſity than Uſe, and would have been but a cond odds, if this had been made an Unit alſo.

For the Variation, or 6th *Equation of the Moon.*

FROM the Place of the Moon the Fifth time Equated, ſubtract the True Place of the un: With this Difference enter the Table, titled s above; where you muſt operate with the reſpective Numbers, in all reſpects, as before, in the econd Equation; which will give you the Place f the Moon the Sixth time Equated.

IN this Equation, where you enter with the un's Anomaly, as the Numbers are greater than the Second Equation, I have given a Table of e Decimal Multiplicators; which taken out in e ſame manner, againſt the Sun's preſent Anoaly, as above in the Integers; and by which ultiplying the Increment before found in the able with the Diſtance of the Sun from the loon, gives the Increment proportion'd, as reuir'd.

IN the preſent Example, the Sun's True Place, z. 9 S. 1 Deg. 47 min. and 7 ſec. ſubtracted om the Fifth time Equated, *viz.* 2 S. 5 Deg. min. and 42 ſec. gives 5 S. 4 Deg. 2 min. and ſec. Againſt which, in the Table, are, 26′ 3″, d 206″ Increment.

NEXT, Againſt the Sun's preſent Anomaly in Table for the preſent Increment, *&c.* the Denal Multiplicator is Unity; by which, multiing the aforeſaid Increment, *viz.* 206″, it will the ſame as before (as it was in the Second uation;) which being therefore added to the uation at firſt found, *viz.* 26′ 3″, gives 29′ ″, to be ſubtracted, as the Table directs, from Place of the Moon, the Fifth time Equated, *viz.* 2 S. 5 Deg. 49 min. and 42 ſec. gives 2 5 Deg. 20 min. and 13 ſec. the Place of the Mo the Sixth time Equated.

For the Seventh Equation of the Moon.

FROM the Place of the Moon, the Seven time Equated, ſubtract the True Place the Sun; with this Diſtance enter the Table the *Seventh Equation of the Moon*; and againſt th ſame, you have an Equation; which added ſubtracted, as the Table directs, gives the Pla of the Moon the Seventh time Equated; whi is her Place in her Orbit.

EXAMPLE.

IN the preſent Example, the Sun's True Pla *viz.* 9 S. 1 Deg. 47 min. and 7 ſec. being ſubtr cted from the Sixth Equated Place of the Mo *viz.* 2 S. 5 Deg. 20 min. and 13 ſec. gives 5 3 Deg. 33 min. and 6 ſec. Againſt which, i the *Table of the Seventh Equation of the Moon*, yo have $1' \, 2''$ to be ſubtracted from the Place of th Moon, the Sixth time Equated, *viz.* 2 S. 5 De 20 min. and 13 ſeconds; which gives 2 S. 5 De 19 min. and 1 ſec. the Place of the Moon, th Seventh time Equated.

BEFORE her Place can be reduc'd to the E cliptic, there muſt firſt be found the True Place Node. Thus,

FROM the Sun's True Place, ſubtract that the Node the Firſt time Equated; with this Diff rence, enter the *Table of the Second Equation*

th

be *Node, and Inclination of the Limit*, &c. A- ainſt which (proportion'd, as in the other Ex- mple) you will have an Equation; which added o, or ſubtracted from (as the Table directs) the foreſaid firſt Equated Place of the Node, gives he True Place requir'd. In the ſaid Table alſo, ou muſt take out (proportion'd in the ſame man- er, &c.) the Inclination of the Limit.

NEXT, Subtract the True Place of the Node us found, from the Place of the Moon in her rbit: With this Difference, enter the *Table of eduction and Exceſs*, &c. taking out the Equation nſwering thereto, as alſo the Exceſs; which Ex- eſs muſt be proportion'd, *viz.* As the greateſt nclination of the Limit, above the leaſt, *viz.* 7′ 45″, is to the preſent (taken out of the Se- ond Equation of the Node;) So is the Exceſs, ken out of the Table, as above, to the preſent xceſs: Which being added to the Simple Re- uction, taken out, as above directed, gives the rue Reduction; which added, or ſubtracted, as e Table directs, to, or from the Moon's ſaid lace in her Orbit, gives her True Place in the cliptic, requir'd.

IN the preſent Example, the Node firſt Equa- d, from the Sun, was found (as in the Third uation of the Moon) to be 4 S. 18 Deg. 20 in. and 59 ſeconds; againſt which, in the *Table the Second Equation of the Node, proportion'd*, &c. u have 1 Deg. 28 min. and 50 ſeconds, Equa- n, to be ſubtracted from the Firſt equated ce of the Node, *viz.* 4 S. 13 Deg. 26 min. and ſeconds; which makes 4 S. 11 Deg. 57 min. d 18 ſeconds, the True Place of the Node requir'd; and the Inclination of the Limit in the Table, at the ſame time, is 10′ 1″.

NEXT, From the Place of the Moon in her Orbit, *viz.* 2 S. 5 Deg. 19 min. and 11 ſeconds, ſubtract the aforeſaid True Place of the Node, *viz.* 4 S. 11 Deg. 57 min. and 18 ſeconds; with the Difference, *viz.* 9 S. 23 Deg. 21 min. and 5 ſeconds, enter the *Table of Reduction and Exceſs*; againſt which, for the Simple Reduction Equation, you have 4′ 45″, and alſo 35″ for the Exceſs: Which Tabular Exceſs is to be proportion'd as before directed, As the greateſt Inclination, *viz.* 17′ 45″, is to the preſent, 10′ 1″; So is 35″, the Tabular Exceſs, to 20″, that ſought: Which being added to the Simple Reduction Equation, *viz.* 4′ 45″, gives 5′ 5″, for the Equation of Reduction and Exceſs, in the ſaid preſent Example: Which being added to the Place of the Moon in her Orbit, according to the Direction of the Table, gives 2 S. 5 Deg. 24 min. and 16 ſeconds, the True Place of the Moon in the Ecliptic, requir'd.

OR, If the Product of the preſent Inclination of the Limit, and preſent Tabular Exceſs, be multiply'd by the Conſtant Factor .0563, you will have the proportion'd Exceſs requir'd.

For the Latitude of the Moon.

WITH the aforeſaid Diſtance of the Node, the Second time Equated, from the Moon in her Orbit, enter the *Table of the Moon's Latitude*, &c. taking out the Simple Equation againſt the ſame (proportion'd, *&c.*) as alſo the Increment; which Increment muſt be proportion'd in the ſame manner, and with the ſame Numbers as before in the Exceſs; which Increment ſo proportion'd, being always added to to the Simple Latitude, gives the Moon's True Latitude ſought.

In the preſent Example, the aforeſaid Diſtance of the Node from the Moon, is, 9 S. 23 Deg. 21 min. and 53 ſeconds; againſt which, in the Table aforeſaid (proportion'd) you have 4° 35′ 1″, the Simple Lairude South Deſcending; alſo 16′ 17″, for the Increment; which proportion'd, as before in the Exceſs, gives 9′ 11″; which being added to the aforeſaid Simple Latitude, *viz.* 4° 45′ 1″, gives 4° 44′ 12″, True South Latitude Deſcending of tbe Moon requir'd.

For the Eccentricity of the Moon.

WITH the aforeſaid Diſtance of the Apoge the Firſt time Equated from the Sun, Ente the *Table of Eccentricities* ; where operating wit thoſe Numbers, as in other Equations, &c. yo will have the Eccentricity requir'd.

IN the preſent Example, the ſaid Diſtanc has been found to be 6 S. 9 Deg. 20 min and 42 ſeconds *, and the Decimal of the 20 min 42 ſec. .345. Againſt 6 S. 9° is 66302; and againſt 6° 10′ 66192 ; their Difference is 110, decreaſing which, being multiply'd by .345, gives 38 *fere*; which being ſubtracted from 66302 (as it was decreaſing) gives 66264, the Eccentricity requir'd.

* *Vide the* Tab'lature.

For the Moon's Horizontal Parallax.

ENTER the TABLE thereof, at the greateſt and leaſt Eccentricities, with the Mean Anomaly of the Moon before found ; againſt which, find the Horizontal Parallaxes to the ſaid greateſt and leaſt Eccentricities, and take their Difference : Next, ſubtract the leaſt Eccentricity from the preſent. Then, As the difference of the leaſt and greateſt Eccentricities, is to the difference between the leaſt and preſent Eccentricities ; So is the aforeſaid difference of the Horizontal Parallaxes, to the preſent Difference thereof: Which being added, or ſubtracted, as the na-

ture of the ſame requires, gives the preſent Ho-
ontal Parallax ſought.

EXAMPLE.

In the preſent Example, the Mean Anomaly
the Moon is, 11 S 7 Deg. 25 min. and 56 ſec.
e Horizontal Parallaxes anſwering thereto, are,
' 8'', and 55' 17'', and the Difference, 1' 9''
creaſing. The Difference between the greateſt
d leaſt Eccentricities, which is a conſtant Quan-
y. as in the Table, is, 23454; and the Differ-
ce between the leaſt Eccentricity, *viz.* 43319,
d the preſent, before found, *viz.* 66264, is
945: Then the Proportion, as above, is,
s 23454 : 22945 :: 69'' : 68'' *fere*; Which, as it
decreaſing, being ſubtracted from the aforeſaid
min. 17 ſeconds, gives 54 min. 9 ſeconds,
e Horizontal Parallax requir'd; ſuppoſing the
oon to be in the *Syzygys*, viz. in the Conjuncti-
or Oppoſition: Otherwiſe, from the true Place
the Moon laſt found, ſubtract the true Place
the Sun; with this Difference, enter the *Table*
r the Horizontal Parallax out of the Syzygys;
om whence taking the Decimal Multiplicator,
d multiplying the preſent Horizontal Parallax
ereby, gives an Equation; which muſt always
ſubtracted from the Horizontal Parallax before
und, for the *Syzygys*; which Remainder will
en be the true Horizontal Parallax requir'd.

In the preſent Example, the Decimal Multi-
icator will be found to be .383; by which mul-
plying 54'.15, the Horizontal Parallax in the
ygy before found, the Product will be 21'' *fere*;
hich ſubtracted from 54' 9'', the Horizontal Pa-
llax in the *Syzygy*, gives 53' 48'', the true
orizontal Parallax requir'd.

For

For the Horizontal Semidiameter of the Moon.

AS the Mean Horizontal Parallax, 57 m 30 ſeconds, is to the Mean Horizon Semidiameter, 15 min. 45 ſeconds; ſo is t preſent Horizontal Parallax, to the preſent Ho zontal Semidiameter.

As the Mean Horizontal Parallax and Semidi meter are conſtant Quantities; their *Ratio*, v .274, will be a conſtant Quantity: By which you always multiply the preſent Horizontal Par lax, you will have the Horizontal Semidiame of the Moon requir'd.

In the preſent Example, the Horizontal P rallax, *viz.* 53′.8 multiply'd by .274, gi 14′.7412, *viz.* 14 min. 44 ſeconds, the Horizo tal Semidiameter of the Moon requir'd.

TAB'L

TABLATURE *of the Whole* CALCULUS.

735, Equ. Time. h. ′	☉ true Place S. ° ′ ″	☽ Mean Anom. S. ° ′ ″	☉ Apogé. S. ° ′ ″
Dec. 12. 5 27 P.M.	9 1 47 7	5 23 46 36	3 8 17 31
Equal Time.	☽ Me. Long S. ° ′ ″	☽ Apogé S. ° ′ ″	☽ Node ☊ S. ° ′ ″
1736, *Dec.* 12, *Nn.*	5 11 24 13	0 1 7 25	5 22 5 15
Ho. 5 +	2 44 42	1 24	Sum — 44″ { 40
Min. 27 +	14 49	8	4
	5 14 23 44	0 1 8 57	5 22 4 31
Year 2. à Rad. +	8 18 46 7	+ 2 21 19 41	— 1 8 39 26
1738, *Dec.* 12, &c.	2 3 9 51	2 22 28 38	4 13 25 5
1*ſt* Equation +	1 18	— 3 13	+ 1 3
☽ Equd. 1*ſt* time	2 3 11 9	2 22 26 25	4 13 26 8
2*d* Equation —	1 15	6 9 20 42	4 18 20 59
		.345 ☽ Apog. à ☉	☊ Node à ☉
☽ Equd. 2*d* time	2 3 9 54		— 1 28 50
3*d* Equation —	47	4 15 10 54 ☉ *Ap.* à ☽ *Ap.* &c	☊ 2*d Eqn. Node*
☽ Equd. 3*d* time	2 3 9 7	+ 3 15 3	4 11 57 18 ☊ tr. Pla. Node
4*th* Equation —	1 43	2*d*. Eqn. ☽ Ap.	Incl. Limit 10′
☽ Equd. 4*th* time	2 3 7 24	2 25 41 28	9 23 21 53
Elliptic Equat. +	2 42 18	Ap. ☽ 2. ti. Eqd.	☊ à ☽ in her *Orb.*
		11 7 25 56	
☽ Equd. 5*th* time	2 5 49 42	.437	Reduct. 4′ 45″
Variation —	29 29	☽ Me. Anom.	*Tab Exc.* 35″ pr. 20″
		5 4 2 35 ☉ à ☽ 5*th* ti. Eqd	☽ M. Lt. So. *Deſc.* } 4° 35′ 1″
☽ Equd. 6*th* time	2 5 20 13		
7*th* Equation	1 2	5 3 33 6 ☉ à ☽ 6*th* ti. Eqd	*Tab Increm.* 16′ 17″. *Preſent* 9′ 11″.
☽ in her Orbit	2 5 19 11		Eccen. 66:64 Hor. Paral. 53′ 48″
Red. and Exc. +	5 5		D°. Semid. 14′ 44′
☽ in the Eclipt.	2 5 24 16		
☽ *Tr. Lat.* So. deſc.	4 44 12		

For a Confirmation of the Truth of the ormer Method, in obtaining the true *Elliptic Equation* of the Moon; I ſhall here exhibit an aſy Logarithmic Calculation thereof, with the *Data* of the preſent Example, *viz.*

With the aforeſaid Diſtance of the Moon's Apoge, the Firſt time Equated from the Sun, nter the Table, titled, *Conſtant Logarithms for he Elliptic Equation of the Moon*; which, as beore, of the Eccentricity, muſt be taken out, and roportion'd, as requiſite.

In the preſent Example, in the ſaid Table, gainſt 6 Signs, 9 Degrees, you find 9.942326; nd againſt 6 Signs, 10 Degrees, 9.942423; heir difference is, 97, increaſing, &c. which 97 eing multiply'd into .345, the Decimal of the xceſs of the aforeſaid Diſtance, above 6 Signs, Degeees *, gives 33; which, as it was an Increaſe, being added to the aforeſaid Conſtant Loarithm, againſt 6 Signs, 9 Degrees, *viz.* 9.942326, ives 9.942359, for that in the preſent Example quir'd.

* *Vide* Tablature.

Next, In the Table, titled, *An Equation to lf the Mean Anomaly of the Moon*, ſeek at the lead thereof, the firſt Four left hand Digits, or laces of the afore-found conſtant Logarithm; which Column, and againſt the preſent Mean nomaly of the Moon, you have an Equation, hich, as the Table directs, muſt be added to, or btracted from, half the ſaid Mean Anomaly of le Moon.

In the preſent Example, the Mean Anomal of the Moon, *viz.* 11 S. 7 Deg. 25 min. and 5 ſeconds, being ſubtracted from the Circle, or 1 Signs, gives 0 S. 22 Deg. 34 min. and 4 ſeconds Againſt which proportion'd, &c. and under 9.94 the Firſt four Digits of the Conſtant Logarithm you have 1 min. 23 ſeconds, an Equation, to b added to half of the afore-order'd Mean Anoma ly, *viz.* 0 S. 11 Deg. 17 min. and 2 ſeconds which gives 0 S. 11 Deg. 18 min. and 25 ſec.

It may be obſerv'd in the Conſtant Logarith at any time thus found, that if the Fifth Plac beginning at the fartheſt to the left hand, excee 5, *viz.* be 7, 8, &c. you muſt then make th preceding Place an Unit more, to enter the Tab with: But if under 5, &c. it is then to be neglected.

If the Conſtant Logarithm thus prepar' cannot be exactly had in the Table, take the ne Leſſer therefrom, and note the difference; whe it will be, As the differenoe between the ſaid leſſ Logarithm, and next greater in the Table (whic is always 5,) is to the aforeſaid noted difference ſo is the Difference of the Equations anſweri to the ſaid greater and leſſer Logarithms, to a Equation; which being (always) ſubtracted fro the Equation anſwering to the leſſer Logarith in the Table, gives the Equation anſwering t the preſent Conſtant Logarithm; which muſt b added, or ſubtracted, to, or from half of th preſent Mean Anomaly, as before, &c.

LASTLY, To the Tangent of half the Mean nomaly thus Equated, add the Conſtant Lo-arithm thus found ; which will give the Tangent f an Arch ; the which being ſubtracted from alf the Mean Anomaly, and the Remainder oubled, gives the True Ecliptic Equation ught.

IN the preſent Example, the Tangent of half e Mean Anomaly thus Equated, *viz.* 11 Deg. 8 min. and 25 ſec. is, 9.300912 ; which added the Conſtant Logarithm before found, *viz.* .942359, gives 9.243271, the Tangent of 9 Deg. 5 min. and 53 ſec. which ſubtracted from half e Mean Anomaly, before it was Equated, *iz.* 11 Deg. 17 min. and 2 ſec. gives 1 Deg. 1 min. and 9 ſeconds ; which doubled, gives Deg. 42 min. and 18 ſeconds, the true Elliptic quation requir'd, the ſame with that found, as efore, *&c.*

THIS Example, well underſtood and pra-is'd, will be found ſufficient for Calculating the loon's Place, any time forward, or to come.

* * *

To Calculate the Place of the Moon for any time p

YOU muſt firſt, as before (and always) obtain the Sun's True Place, *&c.* for the ſam time with that of the Moon, requir'd.

NEXT, In the Radical Year 1736, for t Day and Hour, *&c.* requir'd, take out the Me Places anſwering thereto, as in the precedi Example.

THEN, the Number of Years back from t *Radix*, muſt, in all reſpects, be order'd, as befo of the Sun, with which, entring the *Table of t Mean Motions, and Remainders of the Moon,* *page*, &c. you will have the Numbers which apply'd, as there directed, to thoſe before fou in the Radical Year 1736, will reduce the ſam to the Mean Places, *&c.* for the ſame Day the Month, Hour, *&c.* in the Year requir'd.

EXAMPLE.

LET it be requir'd, to Calculate the Moon Place on *January* the 2*d*, 1729, at Noon.

THE Number of Years back from the *Ra* viz. 7, being prepar'd, as before of the Sun, gi 2 for the Quote, and 1 for the Remainder, & and the Sun's Place, &c. as in the *Tab'lature.*

THE Mean Places of the Moon, Apoge and ode, taken out for *January* the 3*d*, in the Ra- cal Year 1736, as the Year gone back to, is t Leap-Year, are, 10 S. 8 Deg. 43 min. and ſeconds, the Mean Longitude; 10 S. 22 Deg. min. and 57 ſeconds, Apoge; and 6 S. 10 g. 18 min. and 15 ſeconds, for the Node.

NEXT, Againſt 2, the prepar'd Quotient, in the *ble of the Mean Motions*, you have 11 S. 11 Deg. min. and 38 ſeconds, the Moon's Mean Moti- , to be ſubtracted (as calculating back) from the dical Mean Longitude in the Year 1786: But at e ſame time, againſt the prepar'd Remainder, are, S. 9 Deg. 23 min. and 4 ſec. to be added there- : Their Difference therefore, *viz.* 7 S. 2 Deg. nin. and 34 ſeconds, which is Negative, being tracted from the Radical Mean Longitude (as ore, of the Sun), gives 3 S. 6 Deg. 40 min. d 52 ſeconds, the Mean Longitude of the Moon *n.* 2*d*, 1729, at Noon.

NEXT, For the ſame reaſon, the Difference the Mean Motion of the Apoge, againſt 2, aforeſaid Quotient, and 1, the Remainder, . 9 S. 14 Deg. 52 min. and 17 ſeconds, which Negative, being ſubtracted from the aforeſaid dical Mean Motion of the Apoge, gives 1 S. Deg. 55 min. and 40 ſeconds, the Mean Place reof, for the ſaid *Jan.* 2*d*, 1729, at Noon.

NEXT, For the Mean Place of the Node, As Calculating forward, you always ſubtract; for ſame back, you muſt always add, the Num- s anſwering to the ſaid Quotient: But thoſe againſt the Remainder muſt always, as in th Anomaly of the Sun, be ſubtracted: Their diffi rence therefore, which is affirmative, *viz.* 4 15 Deg. 24 min. and 22 ſeconds, being added t the Radical Place of 1736, &c. gives 10 S. 2 Deg. 42 min. and 37 ſeconds, for the Mea Place thereof alſo *January* the 2*d*, 1729, at Noo

ENTRING the reſpective Tables for th Firſt Equation of each, with the Sun's Anomaly proportion'd, &c. you have 3 minutes, 4 ſecond for the Mean Longitude, to be ſubtracted; 5 minutes, 12 ſeconds, to be added to that of th Apoge; and 2 minutes, 28 ſeconds to be ſubtracted from that of the Node; which gives 3 S. Deg. 37 min. and 48 ſeconds, Mean Longitude 1 S. 8 Deg. 0 min. and 52 ſeconds, Apoge, an 10 S. 25 Deg. 40 min. and 9 ſeconds, Node being each of their Places the Firſt time Equated The Diſtance of the Apoge, the Firſt time Equated, from the Sun, is, 8 S. 15 Deg. 24 min with which, entering the *Table of the Second Equation of the Moon*, you have 1 minute, and 4 ſeconds Equation, and 10 ſeconds Increment which ſaid Increment, by the Sun's Anomaly, a before, will be found to continue the ſame: Both which, *viz.* 1 min. 54 ſec. being therefore ſubtracted, as the Table directs, from the Firſt equated Place of the Moon, gives 3 S. 6 Deg 35 min. and 54 ſeconds, Moon's Place the Second time Equated.

THE Diſtance of the Node, the Firſt time Equated, from the Sun, is 10 S. 27 Deg. 44 min and 43 ſeconds; the Equation anſwering to which in the *Table of the Third Equation*, is 42 ſeconds

u

o be ſubtracted ; which gives 3 S. 6 Deg. 35 nin. and 12 ſeconds, Place of the Moon the Third ime Equated.

The Diſtance of the Sun from the Moon, he Third time Equated, is, 5 S. 13 Deg. 10 nin. and 20 ſeconds ; that of the Apoge of the un from the Apoge of the Moon, the Firſt time quated, is, 9 S. 29 Deg. 53 min. and 23 ſeconds ; oth which Sums (the Circle being rejected) make S. 13 Deg. 3 min. and 43 ſeconds. Againſt hich, in the *Table of the Fourth Equation of the oon*, are 2 minutes and 21 ſeconds, to be ſubtracted from the Third Equated Place of the oon ; which gives her Place, the Fourth time quated, *viz.* 3 S. 6 Deg. 32 min. and 51 ſeonds.

In the *Table of the Second Equation of the oon's Apoge*, againſt 8 S. 15 Deg. and 24 min. he Apoge of the Moon, the Firſt time Equated ⊙, proportion'd, &c. are 7 Deg. 16 min. and 6 ſeconds, to be added to the Apoge, the Firſt ime Equated, as before ; which gives 1 S. 15 eg. 17 min. and 18 ſeconds, the Place of the *poge* the Second time Equated.

The Place of the *Apoge* the Second time thus quated, ſubtracted from the Place of the Moon, he Fourth time Equated, gives 1 S. 21 Deg. 5 min. and 33 ſeconds, for the Moon's Mean nomaly.

In the *Table of the Moon's Mean Elliptic Euation*, againſt 1 S. 21 Deg. 15 min. and 33 conds, Mean Anomaly, are, 4 Deg 45 min. and 13

13 ſeconds, Mean Elliptic Equation, to be ſubtr cted. Next, for the *Proſthaphæreſis* hereof, order to reduce it to the True.

THE Diſtance of the *Apoge*, the Firſt ti Equated, from the Sun, 6 Signs being rejecte 75 Deg. 24 min. the true prepar'd Degree; F entering the *Table of Reduction of the Mean to t True Elliptic Equation*, in which, againſt 74, t next leſs Marginal Number, and under 1 S. 2 at the Head, the next leſſer in the Table th the Mean Anomaly, you have 49 min. 28 ſe And at the ſame time, againſt 76, the next grea er Marginal Number, and under 1 S. 21°, likewi of Anomaly, you have 1′ 54″; their Di rence is, 2′ 26″, or 146″ increaſing; the Di ference between the ſaid leſſer Marginal Nu ber, and the True, is, 1 Deg. 24 min. the 24 mi reduc'd to a Decimal, or taken out of the Tab is .4: Whence, the Proportion will be, As 2 (the Difference between the next leſſer and great Marginal Numbers, than the aforeſaid prepar Degree, &c.) is to the Difference of the Numbe anſwering to the ſaid greater and leſſer Margin Numbers, *viz.* 146 ſeconds; ſo is 1°.4 (th Difference between the next leſſer Marginal Nu ber, and the aforeſaid prepar'd Degree, &c.) t 102″, or 1′42″, to be added, as it was increaſing to the ſaid 49 min. 28 ſeconds; which gives 5 min. 10 ſeconds, the Equation to be ſubtracte as the Table directs, from the afore-found Mea Elliptic Equation, *viz.* at 1 S. 21 Deg. Mea Anomaly.

NEXT, In the ſaid Table, under 1 S. 24 Deg.
he next greater than the preſent Mean Anomaly;
gainſt the aforeſaid Marginal Numbers, *viz.*
4 and 76, you have 51′ 38″, and 54′ 10″;
hich order'd and proportion'd, as before*, gives
3′ 24″, to be deducted alſo from the aforeſaid
Iean Elliptic Equation, *viz.* at 1 S. 24 Deg. of
Iean Anomaly: But the preſent Mean Anomaly
1 S. 21 Deg. 15 min. and 33 ſeconds; the
ifference between which, and the next leſſer in
he Table, *viz.* 1 S. 21 Deg. is 15 min. 33 ſe-
onds; the Decimal of which, is .26 *fere.*
Vhence the Proportion will be, As 3 Degrees
the difference between the next leſſer and greater
abular Anomalies, than the preſent) is to 134
econds (the difference between 51′ 10″, and
3′ 24″, the Numbers before found, to the ſaid
abular Anomalies, and the prepar'd Marginal
umber;) ſo is .26 the Decimal of the Differ-
ence between the next leſſer Tabular Anomaly,
nd the preſent Mean Anomaly) to 11 ſeconds;
hich, as the Equation is increaſing, muſt be
dded to 51 min. 10 ſeconds, anſwering, as be-
ore, to the next leſſer Tabular Anomaly, than
he preſent Mean; which gives 51 min. 21 ſe-
onds, the True Equation, to be ſubtracted, as
he Table directs, from the Mean Elliptic Equa-
ion before found, *viz.* 4 Deg. 45 min. and 13
econds; which gives 3 Deg. 53 min. and 52
econds, the True Elliptic Equation requir'd.

* *Vide* Tablet.

X TABLET

* * *

TABLET.

Diſt. Apo. ☽ First time Equated à ⊙ prepar'd 75.4°		*Me. Apo.* ☽ 1 S. 21°	*Me. Ano.* 1 S. 2
Leſſer and Greater Marg. Number than the prepar'd Degree, &c.	74	0 49 28	0 51
	76	0 51 54	0 54
Differences		2 26	2
Ditto in Seconds		146‴	15
Half Diff. tr. prepar'd N° and leſſer Marginal N°		Mult. .7	Mult.
Products to be added to Numbers agſt. leſſ. prep Marg. N°		102″.2	106
Tr. Eqns. to tr. prep. N° 75.4 —		0 51 10	0 53
Diff. ditto *to the gr. and leſſ. Anom.*		2′.24	or .1
Diff. true and leſſer Anomaly (Decim.) .26 ½ *ditto* — —		Mult.	.0 8 107
Equn. to be added to 51′.10, &c.			11′.
		Tr. Equat.	*Me. Ell.*
51′ 10″ + 11″ make ——		— 51 21	4 45
True Elliptic Equation ——			3 53

IF the ſame be requir'd to be prov'd Loga-
hmically, in the *Table of Conſtant Logarithms*,
ainſt 8 S. 15 Deg. the next leſſer Number to
: preſent Diſt. Apoge of the Moon, the Firſt
ie Equated à ☉, you have 9.960648; and
ainſt 8 S. 16 Deg. the next greater, you have
60858; their Difference is, 210. Next, the
fference between the aforeſaid next leſſer Num-
', *viz.* 8 S. 15 Deg. and the True Diſtance of
: Moon's *Apoge*, Equated à ☉, *viz.* 8 S. 15 Deg.
d 24 minutes, is 24 minutes; the Decimal
ereof, .4, multiply'd into 210, the Difference
the aforeſaid two Conſtant Logarithms, as the
ne was increaſing, gives 84; which being added
the leſſer of the aforeſaid *Conſtant Logarithms*,
the ſame was increaſing, gives 9.960732, the *Con-*
nt Logarithm in the preſent Example; which,
order to enter the Table with, titled, *An Equa-*
n, to be added to half the preſent Mean Anomaly
he Moon, may be made 9.961. In which Table,
ainſt the preſent Mean Anomaly, and under
: next leſſer Logarithm, (at the Head thereof)
in the preſent Conſtant Logarithm, *viz.* 9.957,
a have 1' 5''; and under the next greater, *viz.*
62, you have 50''; their difference is 15''
creaſing. The difference between the next
ſer and next greater Logarithms, than the pre-
t Conſtant, as before noted, is always 5.
hence the Proportion alſo, as before noted, will
ways be, As 5 is to the Difference between the
xt leſſer Tabular Logarithm, and the preſent
nſtant Logarithm; ſo is the Difference of the
uations anſwering to the aforeſaid next leſſer
d greater Logarithms, to an Equation to be ſubtra-
d from that anſwering to the ſaid *leſſer Logarithm*,
ich gives the True. The difference between the

preſent Conſtant Logarithm, *viz.* 9.961, and the ne
leſſer, *viz.* 9.957, is, .4: Whence the Proportio
is, As 5 is to 15; ſo is 4 to 12′; which bein
ſubtracted from 1′ 5″, anſwering as before, t
the next leſſer Logarithm, gives 53″, to be a
ded, as the Table directs, to half the preſe
Mean Anomaly, *viz.* 25 Deg. 37 min. 46 ſe
and an half; which makes 25 Deg. 38 min. 3
ſeconds and an half; the Tangent of which, *vi*
9.681304, being added to the Conſtant Log
rithm at firſt found, gives 9.642036, the Ta
gent of 23 Deg. 40 min. 50 ſeconds and an half
which ſubtracted from the ſaid half Mean Ano
maly, *viz.* 25 Deg. 37 min. 46 ſeconds and a
half, gives 1 Deg. 56 min. and 56 ſecond
which doubl'd, gives 3 Deg. 53 min. and 52 ſe
the True Eliptic Equation requir'd, the ſame
before; which, as the Table directs, *viz.* when t
Mean Anomaly of the Moon is under 6 Signs, bein
ſubtracted from the Place of the Moon, the Four
time Equated, *viz.* 3 S. 6 Deg. 32 min. and 51 ſe
gives 3 S. 2 Deg. 38 min. and 59 ſeconds, t
Place of the Moon, the Fifth time Equated.

The Diſtance of the Sun from the Moon, t
Fifth time Equated, will be found to be 5 S.
Deg. 14 min. and 7 ſeconds; with which entrin
the *Table of the Moon's Variation*, againſt the ſa
proportion'd, &c. you have 21′ 55″; alſo 2 53
Increment; for the Reduction of which Inc
ment, entering with the Sun's Anomaly, t
Table of Multiplicators, you have Unity, or
near, that it may be taken for ſuch; by wh
multiplying the ſaid Increment, it will rem
the ſame; which being added to 21′ 55″, ma
24′ 48″; which ſubtracted, as the Table dire
from 3 S. 2 Deg. 38 min. and 59 ſeconds,
Pl

lace of the Moon, the Fifth time Equated, ives 3 S. 2 Deg. 14 min. and 11 ſec. the Place f the Moon, the Sixth time Equated.

The Diſtance of the Sun from the Moon, the ixth time Equated, is, 5 S. 8 Deg. 49 min. and 9 ſec. Againſt which, in the *Table of the Seventh Equation*, are, 50 ſec. to be ſubtracted from he Place of the Moon, the Sixth time Equated, *viz.* 3 S. 2 Deg. 14 min. and 11 ſec. which gives S. 2 Deg. 13 min. and 21 ſec. the Place of the Moon, the Seventh time Equated, and is her Place in her Orbit.

In the *Table of the Second Equation of the Node*, againſt 10 S. 27 Deg. 44 min. and 43 ſec. the Diſtance of the Node, the Firſt time Equated from he Sun, you have 1 Deg. 20 min. and 4 ſec Equation, to be ſubtracted from the Place of the Node the Firſt time Equated, *viz.* 10 S. 25 Deg. 40 min. and 9 ſec. which gives 10 S. 24 Deg. 23 min. and 5 ſec. the true Place of the Node; and at the ſame time, the Inclination of the Limit will be found to be 12 min. 45 ſec.

In the *Table of Reduction and Exceſs*, againſt 4 S. 7 Deg. 53 min. and 17 ſec. the Diſtance of the true Place of the Moon's Node from her Place in her Orbit, you have 6 min. 20 ſec. Equation to be added, and 47 ſeconds Exceſs, to be proportion'd, *viz.* As 17 min. 45 ſeconds, the greateſt Inclination of the Limit, is to 12 min. 45 ſec. the preſent; ſo is 47 min. the Tabular Exceſs, to 34 ſec. preſent Exceſs, *viz.* Decimally, 12.75 into 47 ſeconds, into .0565, gives the ſaid 34 ſeconds *fere*; which being added to the Reduction Equation before found, *viz.* 6 min. 20 ſec. gives 6 min. 54 ſec. the true Reduction Equation; which added, as the Table directs, to the Place of the

Moon in her Orbit, before found, *viz.* 3 S. 2 Deg. 13 min. and 21 ſec. gives 3 S. 2 Deg. 20 min. and 15 ſec. the true Place of the Moon in the Ecliptic requir'd.

In the *Table of ths Moon's Simple Latitude*, &c. againſt 4 S. 7 Deg. 53 min. and 16 ſeconds. the Diſtance of the Moon's Node from her Place in her Orbit, proportion'd, *&c.* you have 3 Deg. 56 min. and 20 ſeconds, Simple Latitude North Deſcending; and at the ſame time, 13 min. and 57 ſeconds Increment; which proportion'd, as before in the Exceſs, *viz.* As 17′ 45″, the greateſt Inclination of the Limit, is to 12′ 45″, the preſent; ſo is 13′ 57″, the Tabular Increment, to 10′, the preſent Increment, *viz.* Decimally, 12.75 into 13.95, gives *fere* 178°; and this into ,056, gives 10′, as before; which added to the Simple Latitude before taken out, *viz.* 3 Deg. 56 min. and 19 ſec. gives 4 Deg. 6 min, and 19 ſeconds, the Moon's True Latitude North Deſcending.

In the *Table of the Eccentricities of the Moon*, againſt 8 S. 15 Deg. 24 min. the aforeſaid Diſtance of the Moon's *Apoge*, the Firſt time Equated from the Sun, proportion'd, *&c.* as before in the Conſtant Logarithm, you have .45178, the Eccentricity of the Moon requir'd.

In the *Table of the Moon's Horizontal Parallaxes*, &c. againſt 1 S. 21 Deg. 15 min. and 33 ſeconds, Mean Anomaly, proportion'd, *&c.* is 55 min. 56 ſeconds, anſwering to the leaſt Horizontal Parallax, and 55 min. 5 ſeconds, to the greateſt: Their difference is, 51 ſeconds; and the difference between the leaſt Eccentricity, and the preſent, is, 01855. Therefore, As the Difference between the leaſt and greateſt Eccentricities, &c. *viz.* 23454 : 51″ :: 01855 : 4″; which ſubtracted from 55 min. 56 ſeconds, gives 55 min. 52 ſeconds, the True Horizontal Parallax in the Syzygy.

NEXT, Againſt the Diſtance of the Sun's True Place, from that of the Moon, in the *Table of the Decimal Multiplicators for the Reduction of the Horizontal Parallax, when out of the Syzygys,* you have .316; by which, multiplying 55′.80, the Horizontal Parallax before-found, the Product (which will be always in Seconds) is 18″ *fere*, to be ſubtracted from the afore-found Horizontal Parallax in the Syzygy; which gives 55 min. 34 ſeconds, the preſent Horizontal Parallax requir'd. The ſaid Horizontal Parallax, 55′.58, multiply'd by .274, gives 15 min. 14 ſeconds *fere*, for the Moon's Horizontal Semidiameter.

* * *

next the Diſtance of the Apoge from the Sun will be found to be $6^{s}\ 9^{\circ}\ 21'\ 55''$, and the ſecond Equation of the Apoge $3^{\circ}\ 15'\ 36''$ additive, from whence the true Place will be $2^{s}\ 25^{\circ}\ 41'\ 47''$, which ſubtracted from $2^{s}\ 3^{\circ}\ 11'\ 11''$, the annual or firſt Equated Place of the Moon gives $11^{s}\ 7^{\circ}\ 29'\ 24''$ for the Mean Anomaly, to which anſwers $2^{\circ}\ 17'\ 52''$ Mean Elliptic Equation. Then, with the Anomaly, *viz.* its Complement, as it exceeds 6 Signs, and the prepared Deg. of the Diſtance of the Apoge from the Sun, entring the Table of the Reduction of the Mean to the true Elliptic Equation, by the foregoing Method it will be found to be $24'\ 2''$, to be added to the abov Mean Elliptic Equation, which gives $2^{\circ}\ 41'$ $54''$, the true Elliptic Equation, and which, a the ſaid Table of the Mean Elliptic Equatio directs, being added to the Place of the Moo firſt equated, *viz.* $2^{s}\ 3^{\circ}\ 11'\ 11''$, gives 2^{s} $5^{\circ}\ 53'\ 5''$ for the Place of the Moon the ſecond Time equated. From which ſubtract the Place of the Sun, and with the Difference, *viz.* $5^{s}\ 4^{\circ}\ 4'\ 59''$ entring the Table of the Variation, proportioned, *&c.* you will have $28'$ $18''$ to be ſubtracted from the laſt equated Place of the Moon, which gives $2^{s}\ 5^{\circ}\ 24'\ 47''$ and is her Place in her Orbit; the Reduction and Exceſs will be found, by the Methods already laid down, to be $5'\ 6''$, to be added to the Orbit-Place, which gives $2^{s}\ 5^{\circ}\ 29'\ 53''$ the Place of the Moon in the Ecliptic. The Latitude, Horizontal Parallax, and Semidiameter, will be found the ſame as in the Example before.

Th

The Place of the Moon, obtained by the *Chronologer*, which is according to the Theory (excepting in the Equant to half Mean Anomaly in the Elliptic Equation) differs from this, which Obſervation has confirmed 4 min. cauſing thereby an Error of about 7 min. in Time.

Note, In order to diſcover any Typographical Error, or the like, that poſſibly may have eſcaped Notice in the Tables, take the Differences next above and beneath the Numbers entered the reſpective Table with; alſo laterally in the Table of the Reduction of the Mean to the True Elliptic Equation of the Moon, when, if the ſaid Differences are equal, or nearly ſo, you may conclude them to be correct, and by which they may eaſily be made ſo, if found otherwiſe.

TABLATURE *of the* CALCULUS.

1736, Equal Time	☉ Me. Long.	☉ Me. Anom.	Eq. ☉ Centre.
	s ° ′ ″ ‴	s ° ′ ″	° ′ ° ′
Dec. 12	9 2 16 17 56	5 24 0 48	5 23 An. —0 14
Ho. P.M. 5	12 19 15	12 19	5 24 —0 12
Min. 27	1 6 32	1 7	Diff. decr. 0 2
			viz. 12
	9 2 29 43 43	5 24 14 14	72
2 Years a Rad.	—28 39 26	—30 41	
			74 245
1738, Dec. (&c.) 12	9 2 1 4 17	5 23 43 33	° ′ ″ 0 14 28 868
Eq. ☉ Centre	—12 58 0	.726	0 1 30 90″.02
☉ true Place	9 1 48 6 17		0 12 58 Eq. ☉ C

1738, Equal Time	☽ Me. Long.
	s ° ′ ″
Dec. (&c.)	2 3 9 51
Ann. or firſt Equa.	+1 20
☽ Equ^d firſt Time	2 3 11 11
Elliptic Equ.	+2 41 54
☽ Eq. ſecond Time	2 5 53 5
Variation	—28 18
☽ in her Orbit	2 5 24 47
Reduc. and Exc.	+5 6
☽ in Ecliptic	2 5 29 53
Lat. So. Deſc.	4 44 12
Conſtant Log.	9.942361

° ′ ″		
11 15 18	½ Me. An.	
+1 23	Equ.	
11 16 41	Tangent	9.299772
9 54 21	Tangent	9.242133
1 20 57	Diff. à ½ Me. Anom.	
×2		
2 41 54	Ellip. Equation	

☽ Apoge.
s ° ′ ″
2 22 28 38
—2 27
2 22 26 11
0 9 21 55 .37 Apo. a ☉
+3 15 36 2d. Equ. Ap.
2 25 41 47 tr. Pl. Apoge
11 7 29 24 .49 ☽ Me. Ano.
0 22 30 36 .51 Comp ☽ An.
5 4 4 59 ☉ a ☽: .083 2d Ti. eq.
Eccent. 06204
Hor. Par 53 48
☽ ½ Dia. 14 44

☽ Node ☊.
s ° ′
4 13 25
+1
4 13 26
4 18 22 .37 ☊ a ☉.
—1 28 2d. Equ. ☊.
4 11 57 tr. Pl. ☊.
Incl. Lim. 10
9. 23 27 ☊ a ☽ Orbit
Reduction +4
Tab. Ex. 35″ pref.
☽ M. Lat. So. Deſc. ° ′ 4 35
Tab. Incr. 16
Preſent 9

he Thirds at the laſt, if under 30, are neglected; if above, a Second is
ted for them.

New and Correct

TABLES

FOR

Calculating the Place of the Sun.

TABLE of the SUN's MEAN MOTION and ANOMALY every Fourth or Leap-Year.

	Quotients.	Mean Motion.					Mean Anomaly.			
		s	°	'	"	‴	s	°	'	"
Theſe Numbers are the Quotients of the Number of Years from the *Radix, viz.* 1736, divided by 4.	1	0	0	1	49	17	0	0	2	13
	2	0	0	3	38	34	0	0	4	27
	3	0	0	5	27	51	0	0	6	40
	4	0	0	7	17	8	0	0	8	54
	5	0	0	9	6	24	0	0	11	7
	6	0	0	10	55	41	0	0	13	20
	7	0	0	12	44	58	0	0	15	34
	8	0	0	14	34	15	0	0	17	47
	9	0	0	16	23	32	0	0	20	0
	10	0	0	18	12	49	0	0	22	14
	20	0	0	36	25	38	0	0	44	28
	30	0	0	54	38	26	0	1	6	42
	40	0	1	12	51	15	0	1	28	56
	50	0	1	31	4	4	0	1	51	9
	60	0	1	49	16	53	0	2	13	24
	70	0	2	7	29	42	0	2	35	38
	80	0	2	25	42	30	0	2	57	51
	90	0	2	43	55	19	0	3	20	5
	100	0	3	2	8	8	0	3	42	19
	200	0	6	4	16	16	0	7	24	37
	300	0	9	6	24	24	0	11	6	56
	400	0	12	8	32	32	0	14	49	15
	500	0	15	10	40	40	0	18	31	33
	600	0	18	12	48	48	0	22	13	52
	700	0	21	14	56	56	0	25	56	11
	800	0	24	17	5	4	0	29	38	29
	900	0	27	19	13	12	1	3	20	28
	1000	1	0	21	21	20	1	7	3	7
		Subtract					*Subtract*			
		s	°	'	"	‴	s	°	'	"
Remainders, or Years from Leap-Year.	1	0	0	14	19	43	0	0	15	20
	2	0	0	28	39	26	0	0	30	41
	3	0	0	42	59	10	0	0	46	1

Radical

Radical Mean Places *of the* Sun, *and* Anomaly, *Anno.* 1736.

JANUARY.

Days	Mean Place.					Mean Anomaly.			
	s	°	'	''	'''	s	°	'	''
1	9	21	14	15	54	6	12	59	43
2	9	22	13	24	14	6	13	58	51
3	9	23	12	32	34	6	14	57	59
4	9	24	11	40	53	6	15	57	7
5	9	25	10	49	13	6	16	56	15
6	9	26	9	57	33	6	17	55	24
7	9	27	9	5	53	6	18	54	32
8	9	28	8	14	13	6	19	53	40
9	9	29	7	22	32	6	20	52	48
10	10	0	6	30	52	6	21	51	56
11	10	1	5	39	12	6	22	51	5
12	10	2	4	47	32	6	23	50	13
13	10	3	3	55	52	6	24	49	21
14	10	4	3	4	11	6	25	48	29
15	10	5	2	12	31	6	26	47	37
16	10	6	1	20	51	6	27	46	46
17	10	7	0	29	11	6	28	45	54
18	10	7	59	37	31	6	29	45	2
19	10	8	58	45	50	7	0	44	10
20	10	9	57	54	10	7	1	43	18
21	10	10	57	2	30	7	2	42	27
22	10	11	56	10	50	7	3	41	35
23	10	12	55	19	10	7	4	40	43
24	10	13	54	27	29	7	5	39	51
25	10	14	53	35	49	7	6	38	59
26	10	15	52	44	9	7	7	38	8
27	10	16	51	52	29	7	8	37	16
28	10	17	51	1	49	7	9	36	24
29	10	18	50	9	8	7	10	35	32
30	10	19	49	17	28	7	11	34	40
31	10	20	48	25	48	7	12	33	49

Radic

Radical Mean Places *of the* SUN, *and* ANOMALY, *Anno* 1756.

FEBRUARY.

Days	Mean Place.					Mean Anomaly.			
	s	°	′	″	‴	s	°	′	″
1	10	21	47	34	7	7	13	32	56
2	10	22	46	42	27	7	14	32	4
3	10	23	45	50	47	7	15	31	12
4	10	24	44	59	6	7	16	30	20
5	10	25	44	7	26	7	17	29	28
6	10	26	43	15	46	7	18	28	37
7	10	27	42	24	6	7	19	27	45
8	10	28	41	32	26	7	20	26	53
9	10	29	40	40	45	7	21	26	1
10	11	0	39	49	5	7	22	25	9
11	11	1	38	57	25	7	23	24	18
12	11	2	38	5	45	7	24	23	26
13	11	3	37	14	5	7	25	22	34
14	11	4	36	22	24	7	26	21	42
15	11	5	35	30	44	7	27	20	50
16	11	6	34	39	4	7	28	19	59
17	11	7	33	47	24	7	29	19	7
18	11	8	32	55	44	8	0	18	15
19	11	9	32	4	3	8	1	17	23
20	11	10	31	12	23	8	2	16	31
21	11	11	30	20	43	8	3	15	40
22	11	12	29	29	3	8	4	14	48
23	11	13	28	37	23	8	5	13	56
24	11	14	27	45	42	8	6	13	4
25	11	15	26	54	2	8	7	12	12
26	11	16	26	2	22	8	8	11	20
27	11	17	25	10	42	8	9	10	28
28	11	18	24	19	2	8	9	9	36
29	11	19	23	27	21	8	10	8	44

Radical Mean Places of the Sun, and Anomaly, Anno 1336.

MARCH.

Days.	Mean Place.					Mean Anomaly.			
	s	°	′	″	‴	s	d	′	″
1	11	20	22	35	41	8	12	7	53
2	11	21	21	44	1	8	13	7	1
3	11	22	20	52	21	8	14	6	9
4	11	23	20	0	40	8	15	5	18
5	11	24	19	9	0	8	16	4	26
6	11	25	18	17	20	8	17	3	34
7	11	26	17	25	40	8	18	2	42
8	11	27	16	34	0	8	19	1	50
9	11	28	15	42	19	8	20	0	58
10	11	29	14	50	39	8	21	0	7
11	0	0	13	58	59	8	22	0	15
12	0	1	13	7	19	8	22	59	23
13	0	2	12	15	39	8	23	58	31
14	0	3	11	23	58	8	24	57	39
15	0	4	10	32	18	8	25	56	47
16	0	5	9	40	38	8	26	55	56
17	0	6	8	58	58	8	27	55	4
18	0	7	7	57	18	8	28	54	12
19	0	8	7	5	37	8	29	53	20
20	0	9	6	13	57	9	0	52	28
21	0	10	5	22	17	9	1	51	36
22	0	11	4	30	37	9	2	50	45
23	0	12	3	38	57	9	3	48	53
24	0	13	2	47	16	9	4	48	1
25	0	14	1	55	36	9	5	47	9
26	0	15	1	3	56	9	6	46	17
27	0	16	0	12	16	9	7	45	25
28	0	16	59	20	36	9	8	44	34
29	0	17	58	28	55	9	9	43	42
30	0	18	57	37	15	9	10	42	50
31	0	19	56	45	35	9	11	41	58

Radica

Radical Mean Places *of the* SUN, *and* ANOMALY, *Anno* 1736.

APRIL.

Days.	Mean Place.					Mean Anomaly.			
	s	°	′	″	‴	s	°	′	″
1	0	20	55	53	53	9	12	41	6
2	0	21	55	2	13	9	13	40	14
3	0	22	54	10	33	9	14	39	22
4	0	23	53	18	52	9	15	38	31
5	0	24	52	27	12	9	16	37	39
6	0	25	51	35	32	9	17	36	47
7	0	26	50	43	52	9	18	35	55
8	0	27	49	52	12	9	19	35	3
9	0	28	49	0	31	9	20	34	11
10	0	29	48	8	51	9	21	33	20
11	1	0	47	17	11	9	22	32	28
12	1	1	46	25	31	9	23	31	36
13	1	2	45	33	51	9	24	30	44
14	1	3	44	42	10	9	25	29	52
15	1	4	43	50	30	9	26	29	0
16	1	5	42	58	50	9	27	28	9
17	1	6	42	7	10	9	28	27	17
18	1	7	41	15	30	9	29	26	25
19	1	8	40	23	49	10	0	25	33
20	1	9	39	32	9	10	1	24	41
21	1	10	38	40	29	10	2	23	49
22	1	11	37	48	49	10	3	22	58
23	1	12	36	57	9	10	4	22	6
24	1	13	36	5	28	10	5	21	14
25	1	14	35	13	48	10	6	20	22
26	1	15	34	22	8	10	7	19	30
27	1	16	33	30	28	10	8	18	38
28	1	17	32	38	48	10	9	17	47
29	1	18	31	47	7	10	10	16	55
30	1	19	30	55	27	10	11	16	3

Radical Mean Places of the Sun, and Anomaly, Anno 1736.

M A Y.

Days	Mean Place.					Mean Anomaly.			
	s	°	'	"	'''	s	°	'	"
1	1	20	30	3	46	10	12	15	11
2	1	21	29	12	6	10	13	14	19
3	1	22	28	20	26	10	14	13	27
4	1	23	27	28	45	10	15	12	36
5	1	24	26	37	5	10	16	11	44
6	1	25	25	45	25	10	17	10	52
7	1	26	24	53	45	10	18	10	0
8	1	27	24	2	5	10	19	9	8
9	1	28	23	10	24	10	20	8	16
10	1	29	22	18	44	10	21	7	25
11	2	0	21	27	4	10	22	6	33
12	2	1	20	35	24	10	23	5	41
13	2	2	19	43	44	10	24	4	49
14	2	3	18	52	3	10	25	3	57
15	2	4	18	0	23	10	26	3	5
16	2	5	17	8	43	10	27	2	14
17	2	6	16	17	3	10	28	1	22
18	2	7	15	25	23	10	29	0	30
19	2	8	14	33	42	11	29	59	38
20	2	9	13	42	2	11	0	58	46
21	2	10	12	50	22	11	1	57	54
22	2	11	11	58	42	11	2	57	3
23	2	12	11	7	2	11	3	56	12
24	2	13	10	15	21	11	4	55	20
25	2	14	9	23	41	11	5	54	28
26	2	15	8	32	1	11	6	53	36
27	2	16	7	40	21	11	7	52	44
28	2	17	6	48	41	11	8	51	53
29	2	18	5	57	0	11	9	51	1
30	2	19	5	5	20	11	10	50	9
31	2	20	4	13	40	11	11	49	17

Radical Mean Places of the Sun, and Anomaly, Anno 1736.

JUNE.

Days.	Mean Place.					Mean Anomaly.			
	s	°	'	"	'''	s	°	'	"
1	2	21	3	21	59	11	12	48	24
2	2	22	2	30	19	11	13	47	32
3	2	23	1	38	59	11	14	46	40
4	2	24	0	46	58	11	15	45	49
5	2	24	59	55	18	11	16	44	57
6	2	25	59	3	38	11	17	44	5
7	2	26	58	11	58	11	18	43	13
8	2	27	57	20	18	11	19	42	21
9	2	28	56	28	37	11	20	41	29
10	2	29	55	36	57	11	21	40	38
11	3	0	54	45	17	11	22	39	46
12	3	1	53	53	37	11	23	38	54
13	3	2	53	1	57	11	24	38	2
14	3	3	54	10	16	11	25	37	10
15	3	4	51	18	36	11	26	36	18
16	3	5	50	26	56	11	27	35	27
17	3	6	49	35	16	11	28	34	35
18	3	7	48	43	36	11	29	33	43
19	3	8	47	51	55	0	0	32	51
20	3	9	47	0	15	0	1	31	59
21	3	10	46	8	35	0	2	31	7
22	3	11	45	16	55	0	3	30	16
23	3	12	44	25	15	0	4	29	24
24	3	13	43	33	34	0	5	28	32
25	3	14	42	41	54	0	6	27	40
26	3	15	41	50	14	0	7	26	48
27	3	16	40	58	34	0	8	25	56
28	3	17	40	6	54	0	9	25	5
29	3	18	39	15	13	0	10	24	13
30	3	19	38	23	33	0	11	23	21

Radical Mean Places *of the* SUN, *and* ANOMALY, *Anno* 1736.

JULY.

Days.	Mean Place.					Mean Anomaly.			
	s	°	′	″	‴	s	°	′	″
1	3	20	37	31	52	0	12	22	29
2	3	21	36	40	12	0	13	21	37
3	3	22	35	48	32	0	14	20	45
4	3	23	34	56	51	0	15	19	54
5	3	24	34	5	11	0	16	19	2
6	3	25	33	13	31	0	17	18	10
7	3	26	32	21	51	0	18	17	18
8	3	27	31	30	11	0	19	16	26
9	3	28	30	38	30	0	20	15	34
10	3	29	29	46	50	0	21	14	43
11	4	0	28	55	10	0	22	13	51
12	4	1	28	3	30	0	23	12	59
13	4	2	27	11	50	0	24	12	7
14	4	3	26	20	9	0	25	11	15
15	4	4	25	28	29	0	26	10	23
16	4	5	24	36	49	0	27	9	32
17	4	6	23	45	9	0	28	8	40
18	4	7	22	53	29	0	29	7	48
19	4	8	22	1	48	1	0	6	56
20	4	9	21	10	8	1	1	6	4
21	4	10	20	18	28	1	2	5	12
22	4	11	19	26	48	1	3	4	21
23	4	12	18	35	8	1	4	3	29
24	4	13	17	43	27	1	5	2	37
25	4	14	16	51	47	1	6	1	45
26	4	15	16	0	7	1	7	0	53
27	4	16	15	8	27	1	8	0	1
28	4	17	14	16	47	1	8	59	10
29	4	18	13	25	6	1	9	58	18
30	4	19	12	33	26	1	10	57	26
31	4	20	11	41	46	1	11	56	34

Radical Mean Places *of the* SUN, *and* ANOMALY, *Anno* 1736.

AUGUST.

Days.	Mean Place.					Mean Anomaly.			
	s	°	′	″	‴	s	°	′	″
1	4	21	10	50	7	1	12	55	42
2	4	22	9	58	27	1	13	54	50
3	4	23	9	6	47	1	14	53	58
4	4	24	8	15	6	1	15	53	7
5	4	25	7	23	26	1	16	52	15
6	4	26	6	31	46	1	17	51	23
7	4	27	5	40	6	1	18	50	31
8	4	28	4	48	26	1	19	49	39
9	4	29	3	56	45	1	20	48	47
10	5	0	3	5	5	1	21	47	56
11	5	1	2	13	25	1	22	47	4
12	5	2	1	21	45	1	23	46	12
13	5	3	0	30	5	1	24	45	20
14	5	3	59	38	24	1	25	44	28
15	5	4	58	46	44	1	26	43	36
16	5	5	57	55	4	1	27	42	45
17	5	6	57	3	24	1	28	41	53
18	5	7	56	11	44	1	29	41	1
19	5	8	55	20	3	2	0	40	9
20	5	9	54	28	23	2	1	39	17
21	5	10	53	36	43	2	2	38	25
22	5	11	52	45	3	2	3	37	34
23	5	12	51	53	23	2	4	36	42
24	5	13	51	1	42	2	5	35	50
25	5	14	50	10	2	2	6	34	58
26	5	15	49	18	22	2	7	34	6
27	5	16	48	26	42	2	8	33	14
28	5	17	47	35	2	2	9	32	23
29	5	18	46	43	21	2	10	31	31
30	5	19	45	51	41	2	11	30	39
31	5	20	45	0	1	2	12	29	47

Radical Mean Places *of the* SUN, *and* ANOMALY, *Anno* 1736.

SEPTEMBER.

Days.	Mean Place.					Mean Anomaly.			
	s	°	'	''	'''	s	°	'	''
1	5	21	44	8	18	2	13	28	55
2	5	22	43	16	38	2	14	28	3
3	5	23	42	24	58	2	15	27	11
4	5	24	41	33	17	2	16	26	20
5	5	25	40	41	37	2	17	25	28
6	5	26	39	49	57	2	18	24	36
7	5	27	38	58	17	2	19	23	44
8	5	28	38	6	37	2	20	22	52
9	5	29	37	14	56	2	21	22	0
10	6	0	36	23	16	2	22	21	9
11	6	1	35	31	36	2	23	20	17
12	6	2	34	39	56	2	24	19	25
13	6	3	33	48	16	2	25	18	33
14	6	4	32	56	35	2	26	17	41
15	6	5	32	4	55	2	27	16	49
16	6	6	31	13	15	2	28	15	58
17	6	7	30	21	35	2	29	15	6
18	6	8	29	29	55	3	0	14	14
19	6	9	28	38	14	3	1	13	22
20	6	10	27	46	34	3	2	12	30
21	6	11	26	54	54	3	3	11	38
22	6	12	26	3	14	3	4	10	47
23	6	13	25	11	34	3	5	9	55
24	6	14	24	19	53	3	6	9	3
25	6	15	23	28	13	3	7	8	11
26	6	16	22	36	33	3	8	7	19
27	6	17	21	44	53	3	9	6	27
28	6	18	20	53	13	3	10	5	36
29	6	19	20	1	32	3	11	4	44
30	6	20	19	9	52	3	12	3	52

Radic

Radical Mean Places *of the* SUN, *and* ANOMALY, *Anno* 1736.

OCTOBER.

Days.	Mean Place.					Mean Anomaly.			
	s	°	′	″	‴	s	°	′	″
1	6	21	18	18	11	3	13	3	0
2	6	22	17	26	31	3	14	2	8
3	6	23	16	34	51	3	15	1	16
4	6	24	15	43	10	3	16	0	25
5	6	25	14	51	30	3	16	59	33
6	6	26	13	59	50	3	17	58	41
7	6	27	13	8	10	3	18	57	49
8	6	28	12	16	30	3	19	56	57
9	6	29	11	24	49	3	20	56	5
10	7	0	10	33	9	3	21	55	14
11	7	1	9	41	29	3	22	54	22
12	7	2	8	49	49	3	23	53	30
13	7	3	7	58	9	3	24	52	38
14	7	4	7	6	28	3	25	51	46
15	7	5	6	14	48	3	26	50	54
16	7	6	5	23	8	3	27	50	3
17	7	7	4	31	28	3	28	49	11
18	7	8	3	39	48	3	29	48	19
19	7	9	2	48	7	4	0	47	27
20	7	10	1	56	27	4	1	46	35
21	7	11	1	4	47	4	2	45	43
22	7	12	0	13	7	4	3	44	52
23	7	12	59	21	27	4	4	44	0
24	7	13	58	29	46	4	5	43	8
25	7	14	57	38	6	4	6	42	16
26	7	15	56	46	26	4	7	41	24
27	7	16	55	54	46	4	8	40	32
28	7	17	55	3	6	4	9	39	41
29	7	18	54	11	25	4	10	38	49
30	7	19	53	19	45	4	11	37	57
31	7	20	52	28	5	4	12	37	5

Radical Mean Places of the Sun, and Anomaly, *Anno* 1736.

NOVEMBER.

Days.	Mean Place.					Mean Anomaly.			
	s	°	'	''	'''	s	°	'	''
1	7	21	51	36	25	4	13	36	13
2	7	22	50	44	45	4	14	35	21
3	7	23	49	53	5	4	15	34	29
4	7	24	49	1	24	4	16	33	38
5	7	25	48	9	44	4	17	32	46
6	7	26	47	18	4	4	18	31	54
7	7	27	46	26	24	4	19	31	2
8	7	28	45	34	44	4	20	30	10
9	7	29	44	43	3	4	21	29	18
10	8	0	43	51	23	4	22	28	27
11	8	1	42	59	43	4	23	27	35
12	8	2	42	8	3	4	24	26	43
13	8	3	41	16	23	4	25	25	51
14	8	4	40	24	42	4	26	24	59
15	8	5	39	33	2	4	27	24	7
16	8	6	38	41	22	4	28	23	16
17	8	7	37	49	42	4	29	22	24
18	8	8	36	58	2	5	0	21	32
19	8	9	36	6	21	5	1	20	40
20	8	10	35	14	41	5	2	19	48
21	8	11	34	23	1	5	3	18	56
22	8	12	33	31	21	5	4	18	5
23	8	13	32	39	41	5	5	17	13
24	8	14	31	48	0	5	6	16	21
25	8	15	30	56	20	3	7	15	29
26	8	16	30	4	40	5	8	14	37
27	8	17	29	13	0	5	9	13	45
28	8	18	28	21	20	5	10	12	54
29	8	19	27	29	39	5	11	12	2
30	8	20	26	37	59	5	12	11	10

Radical Mean Places *of the* SUN, *and* ANOMALY, *Anno* 1736.

DECEMBER.

Days.	Mean Place.					Mean Anomaly.			
	s	°	′	″	‴	s	°	′	″
1	8	21	25	46	18	5	13	10	18
2	8	22	24	54	38	5	14	9	26
3	8	23	24	2	58	5	15	8	34
4	8	24	23	11	17	5	16	7	43
5	8	25	22	19	37	5	17	6	51
6	8	26	21	27	57	5	18	5	59
7	8	27	20	36	17	5	19	5	7
8	8	28	19	44	37	5	20	4	15
9	8	29	18	52	56	5	21	3	23
10	9	0	18	1	16	5	22	2	32
11	9	1	17	9	36	5	23	1	40
12	9	2	16	17	56	5	24	0	48
13	9	3	15	26	16	5	24	59	56
14	9	4	14	34	35	5	25	59	4
15	9	5	13	42	55	5	26	58	12
16	9	6	12	51	15	5	27	57	21
17	9	7	11	59	35	5	28	56	29
18	9	8	11	7	55	5	29	55	37
19	9	9	10	16	14	6	0	54	45
20	9	10	9	24	34	6	1	53	53
21	9	11	8	32	54	6	2	53	1
22	9	12	7	41	14	6	3	52	10
23	9	13	6	49	34	6	4	51	18
24	9	14	5	57	53	6	5	50	26
25	9	15	5	6	13	6	6	49	34
26	9	16	4	14	33	6	7	48	42
27	9	17	3	22	53	6	8	47	50
28	9	18	2	31	13	6	9	46	59
29	9	19	1	39	32	6	10	46	7
30	9	20	0	47	52	6	11	45	15
31	9	20	59	56	12	6	12	44	23

TABLE *of the* SUN's Mean Motion *and* Anomaly.

Hours. I II	o I II	I II III	II III IV	III IV V	Hours. I II	o I II	I II III	II III IV	III IV V
1	0	2	27	51	31	1	16	23	16
2	0	4	55	42	32	1	18	51	[illegible]
3	0	7	23	33	33	1	21	18	58
4	0	9	51	24	34	1	23	46	49
5	0	12	19	15	35	1	26	14	40
6	0	14	47	5	36	1	28	42	30
7	0	17	14	56	37	1	31	10	21
8	0	19	42	47	38	1	33	38	12
9	0	22	10	38	39	1	36	6	3
10	0	24	38	29	40	1	38	33	54
11	0	27	6	20	41	1	41	1	[illegible]
12	0	29	34	10	42	1	43	29	[illegible]
13	0	32	2	1	43	1	45	57	[illegible]
14	0	34	29	52	44	1	48	25	[illegible]
15	0	36	57	43	45	1	50	53	[illegible]
16	0	39	25	34	46	1	53	20	[illegible]
17	0	41	53	25	47	1	55	48	[illegible]
18	0	44	21	15	48	1	58	16	[illegible]
19	0	46	49	6	49	2	0	44	[illegible]
20	0	49	16	57	50	2	3	12	[illegible]
21	0	51	44	48	51	2	5	40	[illegible]
22	0	54	12	39	52	2	8	8	[illegible]
23	0	56	40	30	53	2	10	35	[illegible]
24	0	59	8	20	54	2	13	3	[illegible]
25	1	1	36	11	55	2	15	31	[illegible]
26	1	4	4	2	56	2	17	59	[illegible]
27	1	6	31	53	57	2	20	27	[illegible]
28	1	8	59	44	58	2	22	55	[illegible]
29	1	11	27	35	59	2	25	23	[illegible]
30	1	13	55	25	60	2	27	50	[illegible]

TABLE *for the Equation of the* SUN's *Centre.*

⊙ *Ano.*	SUBTRACT.									⊙ *Ano.*
Sine.	0			1			2			Sine.
°	°	′	″	°	′	″	°	′	″	°
0	0	0	0	0	57	7	1	39	41	30
1	0	1	59	0	58	51	1	40	42	29
2	0	3	59	1	0	33	1	41	41	28
3	0	5	58	1	2	15	1	42	39	27
4	0	7	57	1	3	55	1	43	35	26
5	0	9	56	1	5	35	1	44	29	25
6	0	11	55	1	7	14	1	45	21	24
7	0	13	53	1	8	51	1	46	11	23
8	0	15	51	1	10	27	1	47	0	22
9	0	17	49	1	12	1	1	47	46	21
10	0	19	47	1	13	35	1	48	31	20
11	0	21	45	1	15	7	1	49	13	19
12	0	23	42	1	16	38	1	49	53	18
13	0	25	38	1	18	7	1	50	32	17
14	0	27	37	1	19	36	1	51	9	16
15	0	29	30	1	21	3	1	51	44	15
16	0	31	25	1	22	28	1	52	17	14
17	0	33	20	1	23	51	1	52	48	13
18	0	35	14	1	25	14	1	53	16	12
19	0	37	8	1	26	35	1	53	43	11
20	0	39	1	1	27	55	1	54	7	10
21	0	40	53	1	29	13	1	54	30	9
22	0	42	44	1	30	29	1	54	50	8
23	0	44	35	1	31	43	1	55	9	7
24	0	46	25	1	32	56	1	55	25	6
25	0	48	14	1	34	8	1	55	39	5
26	0	50	2	1	35	18	1	55	51	4
27	0	51	50	1	36	26	1	56	1	3
28	0	53	36	1	37	33	1	56	9	2
29	0	55	22	1	38	38	1	56	15	1
30	0	57	7	1	39	41	1	56	19	0
Sine.	11			10			9			Sine.
	ADD.									

TABLE *for the Equation of the* SUN's *Centre.*

⊙ *Ano.*	SUBTRACT.									⊙ *Ano.*
Sine.	3			4			5			Sine.
	°	′	″	°	′	″	°	′	″	
0	1	56	19	1	41	48	0	59	15	30
1	1	56	20	1	40	48	0	57	26	29
2	1	56	19	1	39	46	0	55	37	28
3	1	56	16	1	38	41	0	53	48	27
4	1	56	12	1	37	35	0	51	57	26
5	1	56	5	1	36	27	0	50	5	25
6	1	55	56	1	35	17	0	48	13	24
7	1	55	45	1	34	5	0	46	19	23
8	1	55	31	1	32	52	0	44	25	22
9	1	55	15	1	31	37	0	42	30	21
10	1	54	58	1	30	20	0	40	34	20
11	1	54	38	1	29	1	0	38	37	19
12	1	54	16	1	27	41	0	36	40	18
13	1	53	52	1	26	19	0	34	41	17
14	1	53	26	1	24	55	0	32	42	16
15	1	52	58	1	23	30	0	30	43	15
16	1	52	27	1	22	3	0	28	43	14
17	1	51	55	1	20	35	0	26	42	13
18	1	51	20	1	19	5	0	24	41	12
19	1	50	44	1	17	33	0	22	39	11
20	1	50	5	1	16	0	0	20	37	10
21	1	49	24	1	14	26	0	18	34	9
22	1	48	42	1	12	50	0	16	31	8
23	1	47	57	1	11	13	0	14	28	7
24	1	47	11	1	9	34	0	12	24	6
25	1	46	22	1	7	54	0	10	21	5
26	1	45	31	1	6	13	0	8	17	4
27	1	44	38	1	4	31	0	6	13	3
28	1	43	43	1	2	47	0	4	9	2
29	1	42	47	1	1	2	0	2	4	1
30	1	41	48	0	59	15	0	0	0	0
Sine.	8			7			6			Sine.
	ADD.									

EQUATION of TIME, *depending on* SUN'S *Anomaly*.													
⊙ Ano	SUBTRACT.												⊙ Ano
Sine.	0		1		2		3		4		5		Sine.
	′	″	′	″	′	″	′	″	′	″	′	″	
0	0	0	3	48	6	39	7	45	6	47	3	57	30
1	0	8	3	55	6	43	7	45	6	43	3	50	29
2	0	16	4	2	6	47	7	45	6	39	3	42	28
3	0	24	4	9	6	50	7	45	6	35	3	35	27
4	0	32	4	15	6	54	7	45	6	30	3	28	26
5	0	40	4	22	6	58	7	44	6	26	3	20	25
6	0	48	4	29	7	1	7	44	6	21	3	13	24
7	0	55	4	35	7	5	7	43	6	16	3	5	23
8	1	3	4	42	7	8	7	42	6	11	2	57	22
9	1	11	4	48	7	11	7	41	6	6	2	50	21
10	1	19	4	54	7	14	7	40	6	1	2	42	20
11	1	27	5	0	7	17	7	38	5	56	2	34	19
12	1	35	5	6	7	19	7	37	5	51	2	26	18
13	1	42	5	12	7	22	7	35	5	45	2	18	17
14	1	50	5	18	7	24	7	34	5	40	2	11	16
15	1	58	5	24	7	27	7	32	5	34	2	3	15
16	2	6	5	30	7	29	7	30	5	28	1	55	14
17	2	13	5	35	7	31	7	28	5	22	1	47	13
18	2	21	5	41	7	33	7	25	5	16	1	39	12
19	2	28	5	46	7	35	7	23	5	10	1	30	11
20	2	36	5	52	7	36	7	20	5	4	1	22	10
21	2	41	5	57	7	38	7	17	4	58	1	14	9
22	2	51	6	2	7	39	7	15	4	50	1	6	8
23	2	58	6	7	7	40	7	12	4	45	0	58	7
24	3	6	6	12	7	41	7	9	4	38	0	49	6
25	3	13	6	16	7	42	7	6	4	31	0	41	5
26	3	20	6	21	7	43	7	2	4	25	0	33	4
27	3	27	6	26	7	44	6	59	4	18	0	25	3
28	3	34	6	30	7	45	6	55	4	11	0	16	2
29	3	41	6	34	7	45	6	51	4	4	0	8	1
30	3	48	6	39	7	45	6	47	3	57	0	0	0
Sine.	11		10		9		8		7		6		Sine.
	ADD.												

EQUATION *of* TIME, *depending on the* SUN's *Place.*

SUBTRACT.

Sign.	0	6	1	7	2	8	Sign.
°	′	″	′	″	′	″	°
0	0	0	8	24	8	45	30
1	0	20	8	34	8	35	29
2	0	40	8	44	8	24	28
3	1	0	8	54	8	13	27
4	1	19	9	2	8	1	26
5	1	39	9	10	7	48	25
6	1	59	9	17	7	34	24
7	2	18	9	24	7	20	23
8	2	37	9	30	7	6	22
9	2	57	9	35	6	50	21
10	3	16	9	40	6	35	20
11	3	34	9	44	6	18	19
12	3	52	9	48	6	2	18
13	4	10	9	50	5	44	17
14	4	28	9	52	5	27	16
15	4	46	9	53	5	8	15
16	5	4	9	54	4	50	14
17	5	20	9	54	4	31	13
18	5	37	9	53	4	11	12
19	5	53	9	51	3	52	11
20	6	9	9	49	3	3	10
21	6	25	9	46	3	11	9
22	6	40	9	42	2	51	8
23	6	54	9	38	2	30	7
24	7	9	9	31	2	9	6
25	7	23	9	25	1	48	5
26	7	36	9	19	1	26	4
27	7	48	9	12	1	5	3
28	8	1	9	4	0	43	2
29	8	13	8	55	0	21	1
30	8	24	8	45	0	0	0
Sign.	5	11	4	10	3	9	Sign.

ADD.

New and Correct

TABLES

FOR

Calculating the Place of the Moon.

TABLE of the MEAN MOTION of the Moon, Apogé, and Node, every Fourth or Leap-Year.

These Numbers are the Quotients of the Number of Years from the Radix, viz. 1736, divided by 4.

Quotients.	☽ Mean Motion.				Motion Apogé.				Motion Node.			
	s	°	′	″	s	°	′	″	s	°	′	″
1	5	20	42	49	5	12	46	3	2	17	22	3
2	11	11	25	38	10	25	32	7	5	4	44	5
3	5	2	8	27	4	8	18	10	7	22	6	9
4	10	22	51	16	9	21	4	13	10	9	28	12
5	4	13	34	5	3	3	50	15	9	26	50	15
6	10	4	16	54	8	16	36	18	3	14	12	18
7	3	24	59	43	1	29	22	21	6	1	34	21
8	9	15	42	32	7	12	8	25	8	18	56	24
9	3	6	25	21	0	24	54	29	11	6	18	27
10	8	27	8	10	6	7	40	30	1	23	40	31
20	5	24	16	20	0	15	21	0	3	17	21	1
30	2	21	24	30	6	23	1	30	5	11	1	30
40	11	18	32	40	1	0	42	0	7	4	42	1
50	8	15	40	50	7	8	22	30	8	28	22	30
60	5	12	49	0	1	16	3	0	10	22	3	1
70	2	9	57	10	7	23	43	30	0	15	43	21
80	11	7	5	20	2	1	24	0	2	9	24	0
90	8	4	13	30	8	9	4	30	4	3	4	31
100	5	1	21	40	2	16	45	0	5	26	45	0
200	10	2	43	20	5	3	30	0	11	23	30	0
300	3	4	5	0	7	20	15	0	5	20	15	0
400	8	5	16	40	10	7	0	0	11	17	0	0
500	1	6	48	20	0	23	45	0	5	13	45	0
600	6	8	10	0	3	10	30	0	11	10	30	0
700	11	9	31	40	5	27	15	0	5	7	15	0
800	4	10	53	20	8	14	0	0	11	4	0	0
900	9	15	15	0	11	0	45	0	5	0	45	0
1000	2	13	36	40	1	17	30	0	10	27	30	0
of single Years after Leap-Year.	Add.				Add.				Subtract			
	s	°	′	″	s	°	′	″	s	°	′	″
1	4	9	23	4	1	10	39	50	0	19	19	43
2	8	18	46	7	2	21	19	41	1	8	39	26
3	0	28	9	10	4	1	59	32	1	27	59	9

Radical Mean Places *of the* Moon, Apogé, *and* Node, *Anno* 1736.

JANUARY.

Days	Mean Place.				Apogé.				Node ☊.			
	s	°	'	"	s	°	'	"	s	°	'	"
1	9	12	22	16	10	22	34	35	6	10	24	36
2	9	25	32	51	10	22	41	16	6	10	21	26
3	10	8	43	26	10	22	47	57	6	10	18	15
4	10	21	54	1	10	22	54	38	6	10	15	4
5	11	5	4	36	10	23	1	19	6	10	11	54
6	11	18	15	11	10	23	8	0	6	10	8	43
7	0	1	25	46	10	23	14	42	6	10	5	33
8	0	14	36	21	10	23	21	23	6	10	2	21
9	0	27	46	56	10	23	28	4	6	9	59	11
10	1	10	57	31	10	23	34	45	6	9	56	1
11	1	24	8	6	10	23	41	26	6	9	52	50
12	2	7	18	41	10	23	48	7	6	9	49	39
13	2	20	29	16	10	23	54	48	6	9	46	29
14	3	3	39	51	10	24	1	29	6	9	43	18
15	3	16	50	26	10	24	8	10	6	9	40	7
16	4	0	1	1	10	24	14	51	6	9	36	57
17	4	13	11	36	10	24	21	32	6	9	33	46
18	4	26	22	11	10	24	28	13	6	9	30	36
19	5	9	32	46	10	24	34	54	6	9	27	25
20	5	22	43	21	10	24	41	35	6	9	24	14
21	6	5	53	56	10	24	48	17	6	9	21	4
22	6	19	4	31	10	24	54	58	6	9	17	53
23	7	2	15	6	10	25	1	39	6	9	14	42
24	7	15	25	41	10	25	8	20	6	9	11	32
25	7	28	36	16	10	25	15	1	6	9	8	21
26	8	11	46	51	10	25	21	42	6	9	5	10
27	8	24	57	26	10	25	28	23	6	9	2	0
28	9	8	8	1	10	25	35	4	6	8	58	49
29	9	21	18	36	10	25	41	45	6	8	55	38
30	10	4	29	12	10	25	48	26	6	8	52	28
31	10	17	39	47	10	25	55	7	6	8	49	17

Radical Mean Places *of the* Moon, Apogé, *and* Node, *Anno* 1736.

FEBRUARY.

Days	Mean Place.				Apogé.				Node ☊.			
	s	°	′	″	s	°	′	″	s	°	′	″
1	11	0	50	22	10	26	1	48	6	8	46	7
2	11	14	0	57	10	26	8	29	6	8	42	57
3	11	27	11	32	10	26	15	10	6	8	39	46
4	0	10	22	7	10	26	21	51	6	8	36	35
5	0	23	32	42	10	26	28	32	6	8	33	24
6	1	6	43	17	10	26	35	13	6	8	30	14
7	1	19	53	52	10	26	41	54	6	8	27	3
8	2	3	4	27	10	26	48	35	6	8	23	53
9	2	16	15	2	10	26	55	16	6	8	20	41
10	2	29	25	37	10	27	1	58	6	8	17	31
11	3	12	36	12	10	27	8	39	6	8	14	20
12	3	25	46	47	10	27	15	20	6	8	11	10
13	4	8	57	22	10	27	22	1	6	8	7	59
14	4	22	7	56	10	27	28	42	6	8	4	48
15	5	5	18	31	10	27	35	23	6	8	1	38
16	5	18	29	7	10	27	42	4	6	7	58	27
17	6	1	39	42	10	27	48	45	6	7	55	17
18	6	14	50	17	10	27	55	26	6	7	52	6
19	6	28	0	52	10	28	2	7	6	7	48	55
20	7	11	11	27	10	28	8	48	6	7	45	45
21	7	24	22	2	10	28	15	30	6	7	42	34
22	8	7	32	37	10	28	22	11	6	7	39	24
23	8	20	43	12	10	28	28	52	6	7	36	13
24	9	3	53	47	10	18	35	33	6	7	33	2
25	9	17	4	22	10	28	42	14	6	7	29	52
26	10	0	14	57	10	28	48	55	6	7	26	41
27	10	13	25	32	10	28	55	36	6	7	23	31
28	10	26	36	7	10	29	2	17	6	7	20	20
29	11	9	46	42	10	29	8	58	6	7	17	9
00	00	00	00	00	00	00	00	00	0	0	00	00

Radical

Radical Mean Places *of the* Moon, Apogé, *and* Node, *Anno* 1736.

MARCH.

Days	Mean Place.				Apogé.				Node ☊.			
	s	°	′	″	s	°	′	″	s	°	′	″
1	11	22	57	17	10	29	15	39	6	7	13	48
2	0	6	7	52	10	29	22	20	6	7	10	48
3	0	19	18	27	10	29	29	1	6	7	7	37
4	1	2	29	2	10	29	35	42	6	7	4	27
5	1	15	39	37	10	29	42	23	6	7	1	16
6	1	28	50	12	10	29	49	5	6	6	58	5
7	2	12	0	47	10	29	55	46	6	6	54	55
8	2	25	11	22	11	0	2	27	6	6	51	44
9	3	8	21	57	11	0	9	8	6	6	48	33
10	3	21	32	32	11	0	15	49	6	6	45	22
11	4	4	43	7	11	0	22	30	6	6	42	11
12	4	17	53	42	11	0	29	11	6	6	39	1
13	5	1	4	17	11	0	35	52	6	6	35	51
14	5	14	14	52	11	0	42	33	6	6	32	40
15	5	27	24	27	11	0	49	14	6	6	29	29
16	6	10	36	2	11	0	55	55	6	6	26	19
17	6	23	46	37	11	1	2	36	6	6	23	8
18	7	6	57	12	11	1	9	17	6	6	19	58
19	7	20	7	48	11	1	15	58	6	6	16	47
20	8	3	18	23	11	1	22	39	6	6	13	36
21	8	16	28	58	11	1	29	21	6	6	10	25
22	8	29	39	33	11	1	36	2	6	6	7	15
23	9	12	50	8	11	1	42	43	6	6	4	4
24	9	26	0	43	11	1	49	24	6	6	0	54
25	10	9	11	18	11	1	56	5	6	5	57	43
26	10	22	21	53	11	2	2	46	6	5	54	32
27	11	5	32	28	11	2	9	27	6	5	51	22
28	11	18	43	3	11	2	16	8	6	5	48	11
29	0	1	53	38	11	2	22	49	6	5	45	0
30	0	15	4	13	11	2	29	30	6	5	41	49
31	0	28	14	48	11	2	36	11	6	5	38	3

Radical Mean Places *of the* Moon, Apogé *and* Node, *Anno* 1736.

A P R I L.

Days	Mean Place.				Apogé.				Node ☊			
	s	°	′	″	s	°	′	″	s	°	′	″
1	1	11	25	23	11	2	42	52	6	5	35	28
2	1	24	35	58	11	2	49	33	6	5	32	18
3	2	7	46	33	11	2	56	14	6	5	29	7
4	2	20	57	8	11	3	2	56	6	5	25	56
5	3	4	7	43	11	3	9	37	6	5	22	46
6	3	17	18	19	11	3	16	18	6	5	19	35
7	4	0	28	53	11	3	22	59	6	5	16	25
8	4	13	39	28	11	3	29	40	6	5	13	14
9	4	26	50	3	11	3	36	21	6	5	10	3
10	5	10	0	38	11	3	43	2	6	5	6	53
11	5	23	11	13	11	3	49	43	6	5	3	42
12	6	6	21	48	11	3	56	24	6	5	0	31
13	6	19	32	23	11	4	3	5	6	4	57	21
14	7	2	42	58	11	4	9	46	6	4	54	10
15	7	15	53	33	11	4	16	27	6	4	50	59
16	7	29	4	8	11	4	23	8	6	4	47	49
17	8	12	14	43	11	4	29	49	6	4	44	38
18	8	25	25	18	11	4	36	30	6	4	41	27
19	9	8	35	53	11	4	43	12	6	4	38	16
20	9	21	46	28	11	4	49	53	6	4	35	6
21	10	4	57	3	11	4	56	34	6	4	31	55
22	10	18	7	38	11	5	3	15	6	4	28	45
23	11	1	18	13	11	5	9	56	6	4	25	34
24	11	14	28	48	11	5	16	37	6	4	22	23
25	11	27	39	23	11	5	23	18	6	4	19	13
26	0	10	49	58	11	5	29	59	6	4	16	2
27	0	24	0	33	11	5	36	40	6	4	12	51
28	1	7	11	8	11	5	43	21	6	4	9	41
29	1	20	21	44	11	5	50	2	6	4	6	30
30	2	3	32	18	11	5	56	43	6	4	3	20

Radical Mean Places *of the* Moon, Apogé, *and* Node, *Anno* 1736.

M A Y.

Day:	Mean Place.				Apogé.				Node ☊			
	s	°	′	″	s	°	′	″	s	°	′	″
1	2	16	42	53	11	6	3	24	6	4	0	
2	2	29	53	28	11	6	10	5	6	3	36	5
3	3	13	4	3	11	6	16	46	6	3	53	4
4	3	26	14	38	11	6	23	28	6	3	50	
5	4	9	25	13	11	6	30	9	6	3	47	
6	4	22	35	48	11	6	36	50	6	3	44	1
7	5	5	46	23	11	6	43	31	6	3	41	
8	5	18	56	58	11	6	50	12	6	3	37	5
9	6	2	7	34	11	6	56	53	6	3	34	4
10	6	15	18	8	11	7	3	34	6	3	31	3
11	6	28	28	44	11	7	10	15	6	3	28	
12	7	11	39	19	11	7	16	56	6	3	25	1
13	7	24	49	54	11	7	23	37	6	3	22	
14	8	8	0	29	11	7	30	18	6	3	18	5
15	8	21	11	4	11	7	36	59	6	3	15	4
16	9	4	21	39	11	7	43	40	6	3	12	3
17	9	17	32	14	11	7	50	22	6	3	9	2
18	10	0	42	49	11	7	57	3	6	3	6	
19	10	13	53	24	11	8	3	44	6	3	2	5
20	10	27	2	59	11	8	10	25	6	2	59	4
21	11	10	14	34	11	8	17	6	6	2	56	
22	11	23	25	9	11	8	23	47	6	2	53	2
23	0	6	35	44	11	8	30	28	6	2	50	1
24	0	19	46	19	11	8	37	9	6	2	47	
25	1	2	56	54	11	8	43	50	6	2	43	5
26	1	16	7	29	11	8	50	31	6	2	40	4
27	1	29	18	4	11	8	57	12	6		37	3
28	2	12	28	39	11	9	3	53	6	2	34	2
29	2	25	39	14	11	9	10	34	6	2	31	1
30	3	8	49	49	11	9	17	15	6	2	28	
31	3	22	0	24	11	9	23	57	6	2	24	5

Radica

Radical Mean Places *of the* Moon, Apogé, *and* Node, *Anno* 1736.

J U N E.

Days	Mean Place.				Apogé.				Node ☊			
	s	°	′	″	s	°	′	″	s	°	′	″
1	4	5	10	59	11	9	30	38	6	2	21	40
2	4	18	21	34	11	9	37	19	6	2	18	29
3	5	1	32	9	11	9	44	0	6	2	15	18
4	5	14	42	44	11	9	50	41	6	2	12	8
5	5	27	53	19	11	9	57	22	6	2	8	57
6	6	11	3	54	11	10	4	3	6	2	5	47
7	6	24	14	29	11	10	10	44	6	2	2	36
8	7	7	25	4	11	10	17	25	6	1	59	25
9	7	20	35	39	11	10	24	6	6	1	56	15
10	8	3	46	14	11	10	30	47	6	1	53	4
11	8	16	56	49	11	10	37	28	6	1	49	53
12	9	0	7	24	11	10	44	9	6	1	46	42
13	9	13	17	59	11	10	50	50	6	1	43	31
14	9	26	28	34	11	10	57	31	6	1	30	21
15	10	9	39	9	11	11	4	13	6	1	37	10
16	10	22	49	44	11	11	10	54	6	1	34	0
17	11	6	0	19	11	11	17	35	6	1	30	49
18	11	19	10	54	11	11	24	16	6	1	27	38
19	0	2	21	29	11	11	30	57	6	1	24	28
20	0	15	32	4	11	11	37	38	6	1	21	17
21	0	28	42	39	11	11	44	19	6	1	18	7
22	1	11	53	14	11	11	51	0	6	1	14	56
23	1	25	3	49	11	11	57	41	6	1	11	45
24	2	8	14	24	11	12	4	22	6	1	8	35
25	2	21	24	59	11	12	11	3	6	1	5	24
26	3	4	35	34	11	12	17	44	6	1	2	13
27	3	17	46	9	11	12	24	25	6	0	59	2
28	4	0	56	45	11	12	31	6	6	0	55	52
29	4	14	7	20	11	12	37	48	6	0	52	41
30	4	27	17	55	11	12	44	29	6	0	49	31
00	0	00	00	00	00	00	00	00	0	0	00	00

Radical

Radical Mean Places *of the* Moon, Apogé, *and* Node, *Anno* 1736.

JULY.

Days	Mean Place.				Apogé.				Node ☊.			
	s	°	′	″	s	°	′	″	s	°	′	″
1	5	10	28	30	11	12	51	10	6	0	46	2
2	5	23	39	5	11	12	57	51	6	0	43	1
3	6	6	49	40	11	13	4	32	6	0	39	59
4	6	20	0	15	11	13	11	13	6	0	36	48
5	7	3	10	50	11	13	17	54	6	0	33	38
6	7	16	21	25	11	13	24	35	6	0	30	2
7	7	29	32	0	11	13	31	16	6	0	27	1
8	8	12	42	35	11	13	37	57	6	0	24	6
9	8	25	53	10	11	13	44	38	6	0	20	5
10	9	9	3	45	11	13	51	19	6	0	17	4
11	9	22	14	20	11	13	58	0	6	0	14	3
12	10	5	24	55	11	14	4	41	6	0	11	2
13	10	18	35	30	11	14	11	22	6	0	8	1
14	11	1	46	5	11	14	18	3	6	0	5	
15	11	14	56	40	11	14	24	45	6	0	1	5
16	11	28	7	15	11	14	31	26	5	29	58	4
17	0	11	17	50	11	14	38	7	5	29	55	3
18	0	24	28	25	11	14	44	48	5	29	52	1
19	1	7	39	0	11	14	51	29	5	29	49	
20	1	20	49	35	11	14	58	9	5	29	45	5
21	2	4	0	10	11	15	4	50	5	29	42	4
22	2	17	10	45	11	15	11	31	5	29	39	2
23	3	0	21	20	11	15	18	13	5	29	36	2
24	3	13	31	55	11	15	24	54	5	29	33	1
25	3	26	42	30	11	15	31	35	5	29	30	
26	4	9	53	5	11	15	38	16	5	29	26	5
27	4	23	3	40	11	15	44	57	5	29	23	4
28	5	6	14	15	11	15	51	38	5	29	20	3
29	5	19	24	50	11	15	58	19	5	29	17	2
30	6	2	35	25	11	16	5	0	5	29	14	1
31	6	15	46	0	11	16	11	41	5	29	11	

Radic

Radical Mean Places *of the* Moon, Apogé, *and* Node, *Anno* 1736.

AUGUST.

Day:	Mean Place.				Apogé.				Node ☊.			
	s	°	′	″	s	°	′	″	s	°	′	″
1	6	28	56	35	11	16	18	22	5	29	7	49
2	7	12	7	10	11	16	25	3	5	29	4	39
3	7	25	17	45	11	16	31	45	5	29	1	28
4	8	8	28	20	11	16	38	26	5	28	58	18
5	8	21	38	55	11	16	45	7	5	28	55	7
6	9	4	49	30	11	16	51	48	5	28	51	56
7	9	18	0	5	11	16	58	29	5	28	48	45
8	10	1	10	40	11	17	5	10	5	28	45	35
9	10	14	21	15	11	17	11	51	5	28	42	24
10	10	27	31	50	11	17	18	32	5	28	39	14
11	11	10	42	25	11	17	25	13	5	28	36	3
12	11	23	53	0	11	17	31	54	5	28	32	53
13	0	7	3	35	11	17	38	36	5	28	29	42
14	0	20	14	10	11	17	45	17	5	28	26	32
15	1	3	24	45	11	17	51	58	5	28	23	21
16	1	16	35	21	11	17	58	39	5	28	20	11
17	1	29	45	56	11	18	5	20	5	28	17	0
18	2	12	56	31	11	18	12	1	5	28	13	49
19	2	26	7	6	11	18	18	42	5	28	10	39
20	3	9	17	41	11	18	25	23	5	28	7	28
21	3	22	28	16	11	18	32	4	5	28	4	18
22	4	5	38	51	11	18	38	45	5	28	1	7
23	4	18	49	26	11	18	45	26	5	27	57	56
24	5	2	0	1	11	18	52	7	5	27	54	46
25	5	15	10	36	11	18	58	49	5	27	51	35
26	5	28	21	11	11	19	5	30	5	27	48	24
27	6	11	31	46	11	19	12	11	5	27	45	13
28	6	24	42	21	11	19	18	52	5	27	42	3
29	7	7	52	56	11	19	25	33	5	27	38	52
30	7	21	3	31	11	19	32	14	5	27	35	42
31	8	4	14	6	11	19	38	55	5	27	32	31

Radical Mean Places *of the* Moon, Apogé, *and* Node, *Anno* 1736.

SEPTEMBER.

Days	Mean Place.				Apogé.				Node ☊.			
	s	°	′	″	s	°	′	″	s	°	′	″
1	8	17	24	41	11	19	45	36	5	27	29	20
2	9	0	35	16	11	19	52	17	5	27	26	10
3	9	13	45	51	11	19	58	58	5	27	22	59
4	9	26	56	26	11	20	5	39	5	27	19	49
5	10	10	7	1	11	20	12	20	5	27	16	38
6	10	23	17	36	11	20	19	1	5	27	13	27
7	11	6	28	11	11	20	25	42	5	27	10	16
8	11	19	38	46	11	20	32	23	5	27	7	6
9	0	2	49	21	11	20	39	5	5	27	3	55
10	0	15	59	56	11	20	45	46	5	27	0	44
11	0	29	10	31	11	20	52	27	5	26	57	33
12	1	12	21	6	11	20	59	8	5	26	54	23
13	1	25	31	41	11	21	5	49	5	26	51	12
14	2	8	42	16	11	21	12	30	5	26	48	2
15	2	21	52	51	11	21	19	11	5	26	44	51
16	3	5	3	26	11	21	25	52	5	26	41	40
17	3	18	14	1	11	21	32	33	5	26	38	30
18	4	1	24	36	11	21	39	14	5	26	35	19
19	4	14	35	11	11	21	45	55	5	26	32	9
20	4	27	45	46	11	21	52	36	5	26	28	58
21	5	10	56	21	11	21	59	17	5	26	25	47
22	5	24	6	56	11	22	5	58	5	26	22	37
23	6	7	17	31	11	22	12	39	5	26	19	26
24	6	20	28	6	11	22	19	21	5	26	16	16
25	7	3	38	41	11	22	26	2	5	26	13	5
26	7	16	49	16	11	22	32	43	5	26	9	54
27	7	29	59	51	11	22	39	24	5	26	6	44
28	8	13	10	26	11	22	46	5	5	26	3	33
29	8	26	21	1	11	22	52	46	5	26	0	23
30	9	9	31	36	11	22	59	27	5	25	57	12
00	0	00	00	00	00	00	00	00	0	00	00	00

Radical Mean Places *of the* Moon, Apogé, *and* Node, *Anno* 1736.

O C T O B E R.

Days	Mean Place.				Apogé.				Node ☊.			
	s	°	′	″	s	°	′	″	s	°	′	″
1	9	22	42	11	11	23	6	8	5	25	54	1
2	10	5	52	46	11	23	12	49	5	25	50	51
3	10	19	3	21	11	23	19	30	5	25	47	40
4	11	2	13	56	11	23	26	11	5	25	44	30
5	11	15	24	31	11	23	32	52	5	25	41	19
6	11	28	35	7	11	23	39	33	5	25	38	8
7	0	11	45	42	11	23	46	14	5	25	34	57
8	0	24	56	17	11	23	52	56	5	25	31	47
9	1	8	6	52	11	23	59	37	5	25	28	36
10	1	21	17	27	11	24	6	18	5	25	25	26
11	2	4	28	2	11	24	12	59	5	25	22	15
12	2	17	38	37	11	24	19	40	5	25	19	4
13	3	0	49	12	11	24	26	21	5	25	15	54
14	3	13	59	47	11	24	33	2	5	25	12	43
15	3	27	10	22	11	24	39	43	5	25	9	32
16	4	10	20	57	11	24	46	24	5	25	6	21
17	4	23	31	32	11	24	53	5	5	25	3	11
18	5	6	42	7	11	24	59	46	5	25	0	0
19	5	19	52	42	11	25	6	27	5	24	56	50
20	6	3	3	17	11	25	13	8	5	24	53	39
21	6	16	13	52	11	25	19	49	5	24	50	28
22	6	29	24	27	11	25	26	30	5	24	47	18
23	7	12	35	2	11	25	33	11	5	24	44	7
24	7	25	45	37	11	25	39	52	5	24	40	57
25	8	8	56	12	11	25	46	33	5	24	37	46
26	8	22	6	47	11	25	53	15	5	24	34	35
27	9	5	17	22	11	25	59	56	5	24	31	25
28	9	18	27	57	11	26	6	37	5	24	28	14
29	10	1	38	32	11	26	13	18	5	24	25	4
30	10	14	49	7	11	26	19	59	5	24	21	53
31	10	27	59	42	11	26	26	40	5	24	18	42

Radical Mean Places *of the* Moon, Apogé, *and* Node, *Anno* 1736.

NOVEMBER.

Days.	Mean Place.				Apogé.				Node ☊.			
	s	°	′	″	s	°	′	″	s	°	′	″
1	11	11	10	17	11	26	33	21	5	24	15	31
2	11	24	20	52	11	26	40	2	5	24	12	21
3	0	7	31	27	11	26	46	43	5	24	9	10
4	0	20	42	2	11	26	53	24	5	24	5	59
5	1	3	52	37	11	27	0	5	5	24	2	4
6	1	17	3	12	11	27	6	47	5	23	59	3
7	2	0	13	47	11	27	13	28	5	23	56	2
8	2	13	24	22	11	27	20	9	5	23	53	1
9	2	26	34	57	11	27	26	50	5	23	50	6
10	3	9	45	32	11	27	33	31	5	23	46	5
11	3	22	56	7	11	27	40	12	5	23	43	4
12	4	6	6	42	11	27	46	53	5	23	40	3
13	4	19	17	17	11	27	53	34	5	23	37	2
14	5	2	27	52	11	28	0	15	5	23	34	1
15	5	15	38	27	11	28	6	56	5	23	31	
16	5	28	49	2	11	28	13	37	5	23	27	5
17	6	11	59	37	11	28	20	18	5	23	24	41
18	6	25	10	12	11	28	26	59	5	23	21	3
19	7	8	20	47	11	28	33	40	5	23	18	2
20	7	21	31	22	11	28	40	21	5	23	15	9
21	8	4	41	57	11	28	47	3	5	23	11	5
22	8	17	52	32	11	28	53	44	5	23	8	4
23	9	1	3	7	11	29	0	25	5	23	5	3
24	9	14	13	43	11	29	7	6	5	23	2	2
25	9	27	24	18	11	29	13	47	5	22	59	1
26	10	10	34	53	11	29	20	28	5	22	56	
27	10	23	45	28	11	29	27	9	5	22	52	
28	11	6	56	3	11	29	33	50	5	22	49	4
29	11	20	6	38	11	29	40	31	5	22	46	3
30	0	3	17	13	11	29	47	12	5	22	43	2
00	0	00	00	00	00	00	00	00	0	00	00	0

Radi

Radical Mean Places *of the* Moon, Apogé *and* Node, *Anno* 1736.

DECEMBER.

Days	Mean Place.				Apogé.				Node ☊			
	s	°	′	″	s	°	′	″	s	°	′	″
1	0	16	27	48	11	29	53	53	5	22	40	12
2	0	29	38	23	0	0	0	34	5	22	37	1
3	1	12	48	58	0	0	7	15	5	22	33	51
4	1	25	59	33	0	0	13	56	5	22	30	40
5	2	9	10	8	0	0	20	37	5	22	27	29
6	2	22	20	43	0	0	27	18	5	22	24	19
7	3	5	31	18	0	0	34	0	5	22	21	8
8	3	18	41	53	0	0	40	41	5	22	17	58
9	4	1	52	28	0	0	47	22	5	22	14	47
10	4	15	3	3	0	0	54	3	5	22	11	36
11	4	28	13	38	0	1	0	44	5	22	8	26
12	5	11	24	13	0	1	7	25	5	22	5	15
13	5	24	34	48	0	1	14	6	5	22	2	5
14	6	7	45	23	0	1	20	47	5	21	58	54
15	6	20	55	58	0	1	27	28	5	21	55	43
16	7	4	6	33	0	1	34	9	5	21	52	32
17	7	17	17	8	0	1	40	50	5	21	49	22
18	8	0	27	43	0	1	47	32	5	21	46	11
19	8	13	38	18	0	1	54	13	5	21	43	0
20	8	26	48	53	0	2	0	54	5	21	39	49
21	9	9	59	28	0	2	7	35	5	21	36	38
22	9	23	10	3	0	2	14	16	5	21	33	28
23	10	6	20	38	0	2	20	57	5	21	30	17
24	10	19	31	13	0	2	27	38	5	21	27	6
25	11	2	41	48	0	2	34	19	5	21	23	56
26	11	15	52	23	0	2	41	0	5	21	20	45
27	11	29	2	58	0	2	47	41	5	21	17	35
28	0	12	13	33	0	2	54	22	5	21	14	24
29	0	25	24	8	0	3	1	3	5	21	11	14
30	1	8	34	43	0	3	7	44	5	21	8	4
31	1	21	45	19	0	3	14	25	5	21	4	53

TABLE *of the Mean Motion of the* Moon, Apogé, *and* Node, *in Hours, Minutes, &c.*

	☽			Apoge		Node.	
Hours.	0	I	II	I	II	I	II
I	I	II	III	II	III	II	III
II	II	III	IV	III	IV	III	IV
0	°	′	″	′	″	′	″
1	0	32	56	0	17	0	8
2	1	5	53	0	33	0	16
3	1	38	49	0	50	0	24
4	2	11	46	1	7	0	32
5	2	44	42	1	24	0	40
6	3	17	39	1	40	0	48
7	3	50	35	1	57	0	56
8	4	23	32	2	14	1	4
9	4	56	28	2	30	1	12
10	5	29	25	2	47	1	19
11	6	2	21	3	4	1	27
12	6	35	18	3	21	1	35
13	7	8	14	3	37	1	43
14	7	41	10	3	54	1	51
15	8	14	7	4	11	1	59
16	8	47	3	4	27	2	7
17	9	20	0	4	44	2	15
18	9	52	56	5	1	2	23
19	10	25	53	5	18	2	31
20	10	58	49	5	34	2	39
21	11	31	46	5	51	2	47
22	12	4	42	6	8	2	55
23	12	37	39	6	24	3	3
24	13	10	35	6	41	3	11
25	13	43	32	6	58	3	19
26	14	16	28	7	15	3	27
27	14	49	24	7	31	3	34
28	15	22	21	7	48	3	42
29	15	55	17	8	5	3	50
30	16	28	14	8	21	3	58

TABLE *of the Mean Motion of the* Moon, Apogé *and* Node, *in Hours, Minutes, &c. continued*

Hours.	☽			Apogé.		Node.	
	0	I	II	I	II	I	II
I	I	II	III	II	III	II	III
II	II	III	IV	III	IV	III	IV
	°	′	″	′	″	′	″
31	17	1	10	8	38	4	6
32	17	34	7	8	54	4	14
33	18	7	3	9	11	4	22
34	18	39	59	9	28	4	30
35	19	12	55	9	45	4	38
36	19	45	52	10	2	4	46
37	20	18	48	10	19	4	54
38	20	51	45	10	36	5	2
39	21	24	41	10	52	5	10
40	21	57	38	11	8	5	18
41	22	30	34	11	25	5	26
42	23	3	31	11	42	5	34
43	23	36	27	11	59	5	42
44	24	9	24	12	16	5	50
45	24	42	20	12	32	5	58
46	25	15	17	12	48	6	6
47	25	48	13	13	5	6	14
48	26	21	10	13	22	6	22
49	26	54	6	13	39	6	30
50	27	27	3	13	56	6	38
51	27	59	59	14	13	6	46
52	28	32	56	14	30	6	54
53	29	5	52	14	46	7	1
54	29	38	49	15	2	7	8
55	30	11	45	15	19	7	16
56	30	44	42	15	36	7	24
57	31	17	38	15	53	7	32
58	31	50	34	16	10	7	40
59	32	23	31	16	26	7	48
60	32	56	27	16	43	7	56

TABLE *of the Firſt Equation of the* MOON.
(*According to Sir* ISAAC NEWTON)

☉ *Me. Ano.*	ADD.												☉ *Me. Ano.*
Sign.	0		1		2		3		4		5		Sign.
	′	″	′	″	′	″	′	″	′	″	′	″	
0	0	0	5	48	10	7	11	49	10	20	6	1	30
1	0	12	5	59	10	14	11	49	10	14	5	50	29
2	0	24	6	9	10	20	11	49	10	8	5	39	28
3	0	36	6	19	10	26	11	49	10	1	5	28	27
4	0	48	6	29	10	31	11	48	9	55	5	16	26
5	1	1	6	40	10	37	11	47	9	48	5	5	25
6	1	13	6	50	10	42	11	46	9	41	4	54	24
7	1	25	7	0	10	47	11	45	9	33	4	42	23
8	1	37	7	10	10	52	11	44	9	26	4	30	22
9	1	49	7	19	10	57	11	42	9	18	4	19	21
10	2	0	7	28	11	1	11	41	9	11	4	7	20
11	2	12	7	38	11	6	11	39	9	2	3	55	19
12	2	24	7	47	11	9	11	36	8	54	3	43	18
13	2	36	7	56	11	14	11	34	8	46	3	31	17
14	2	48	8	5	11	18	11	31	8	37	3	19	16
15	3	0	8	14	11	21	11	29	8	29	3	7	15
16	3	11	8	23	11	24	11	25	8	20	2	55	14
17	3	23	8	31	11	27	11	22	8	11	2	43	13
18	3	35	8	39	11	30	11	19	8	2	2	30	12
19	3	46	8	48	11	33	11	15	7	53	2	18	11
20	3	58	8	56	11	35	11	11	7	43	2	5	10
21	4	9	9	4	11	38	11	7	7	34	1	53	9
22	4	20	9	11	11	40	11	2	7	24	1	41	8
23	4	32	9	19	11	42	10	58	7	14	1	28	7
24	4	43	9	26	11	43	10	53	7	4	1	15	6
25	4	54	9	34	11	46	10	48	6	54	1	3	5
26	5	5	9	41	11	47	10	43	6	43	0	50	4
27	5	16	9	48	11	47	10	37	6	33	0	38	3
28	5	27	9	54	11	48	10	32	6	22	0	25	2
29	5	37	10	1	11	48	10	26	6	12	0	12	1
30	5	48	10	7	11	49	10	20	6	1	0	0	0
Sign.	11		10		9		8		7		6		Sign.
☉ *M. A.*	SUBTRACT.												☉ *M. A.*

TABLE *of the Firſt Equation of the* Moon's Apoge.
(*According to Sir* Isaac Newton.)

⊙ M.A.	SUBTRACT.												⊙ M.A.
Sign.	0		1		2		3		4		5		Sign.
	′	″	′	″	′	″	′	″	′	″	′	″	
0	0	0	9	45	17	8	20	0	17	30	10	11	30
1	0	20	10	7	17	19	20	0	17	20	9	52	29
2	0	40	10	24	17	29	20	0	17	9	9	34	28
3	1	1	10	42	17	39	19	59	16	58	9	15	27
4	1	22	10	59	17	48	19	59	16	46	8	56	26
5	1	42	11	16	17	58	19	57	16	35	8	37	25
6	2	3	11	33	18	7	19	56	16	23	8	17	24
7	2	23	11	50	18	16	19	54	16	11	7	58	23
8	2	43	12	6	18	24	19	52	15	58	7	38	22
9	3	4	12	23	18	32	19	49	15	45	7	18	21
10	3	24	12	39	18	39	19	46	15	32	6	58	20
11	3	44	12	55	18	46	19	42	15	18	6	38	19
12	4	4	13	10	18	53	19	39	15	4	6	18	18
13	4	24	13	26	19	0	19	35	14	50	5	58	17
14	4	45	13	41	19	6	19	30	14	36	5	38	16
15	5	4	13	56	19	12	19	25	14	21	5	17	15
16	5	24	14	11	19	18	19	20	14	6	4	56	14
17	5	44	14	25	19	23	19	14	13	51	4	35	13
18	6	4	14	39	19	28	19	8	13	36	4	15	12
19	6	23	14	53	19	33	19	2	13	20	3	54	11
20	6	43	15	7	19	37	18	55	13	4	3	33	10
21	7	2	15	21	19	41	18	48	12	48	3	12	9
22	7	21	15	33	19	44	18	41	12	31	2	51	8
23	7	40	15	46	19	48	18	33	12	15	2	30	7
24	7	59	15	59	19	51	18	25	11	58	2	8	6
25	8	18	16	11	19	53	18	18	11	41	1	46	5
26	8	36	16	23	19	55	18	8	11	23	1	25	4
27	8	54	16	35	19	57	17	59	11	5	1	4	3
28	9	13	16	46	19	58	17	50	10	47	0	43	2
29	9	31	16	57	19	59	17	40	10	30	0	21	1
30	9	49	17	8	20	0	17	30	10	11	0	0	0
Sign.	11		10		9		8		7		6		Sign.
⊙ M.A.	A D D.												⊙ M.A.

TABLE of the First Equation of the MOON's Node. (According to Sir ISAAC NEWTON.)

☉ Me. Ano.	ADD.											
Sign.	0		1		2		3		4		5	
	′	″	′	″	′	″	′	″	′	″	′	″
0	0	0	4	40	8	9	9	30	8	19	4	50
1	0	9	4	48	8	14	9	30	8	14	4	41
2	0	19	4	57	8	18	9	30	8	9	4	32
3	0	29	5	5	8	24	9	30	8	4	4	23
4	0	39	5	13	8	28	9	29	7	58	4	14
5	0	49	5	21	8	32	9	29	7	53	4	5
6	0	58	5	29	8	36	9	28	7	48	3	56
7	1	8	5	37	8	40	9	27	7	41	3	47
8	1	18	5	45	8	44	9	26	7	35	3	38
9	1	27	5	53	8	48	9	25	7	29	3	28
10	1	37	6	0	8	52	9	24	7	23	3	19
11	1	47	6	8	8	55	9	22	7	16	3	9
12	1	56	6	15	8	58	9	20	7	10	3	0
13	2	6	6	23	9	2	9	18	7	3	2	50
14	2	15	6	30	9	5	9	16	6	56	2	40
15	2	25	6	37	9	7	9	14	6	49	2	30
16	2	34	6	44	9	10	9	11	6	42	2	20
17	2	43	6	51	9	12	9	8	6	35	2	11
18	2	53	6	58	9	15	9	6	6	27	2	1
19	3	2	7	4	9	17	9	3	6	20	1	51
20	3	11	7	11	9	19	9	59	6	12	1	40
21	3	20	7	17	9	21	8	56	6	5	1	31
22	3	29	7	23	9	23	8	53	6	56	1	21
23	3	38	7	29	9	24	8	49	5	49	1	11
24	3	47	7	35	9	26	8	45	5	41	1	1
25	3	56	7	41	9	26	8	41	5	33	0	51
26	4	5	7	47	9	28	8	37	5	24	0	41
27	4	14	7	52	9	28	8	33	5	16	0	30
28	4	23	7	58	9	29	8	28	5	8	0	20
29	4	31	8	3	9	29	8	23	4	59	0	10
30	4	40	8	8	9	30	8	19	4	50	0	0
Sign.	11		10		9		8		7		6	
	SUBTRACT.											

TABLE *of the Second Equation of the* MOON.
(*According to Sir* ISAAC NEWTON.)

☽ Apo. à ☉	SUBTRACT.									☽ Apo. à ☉
	Signs. 0	6	Increment.	Signs. 1	7	Increment.	Signs. 2	8	Increment.	
	′	″	″	′	″	″	′	″	″	
0	0	0	0	3	5	19	3	5	19	30
1	0	7	1	3	9	19	3	1	19	29
2	0	15	1	3	12	20	2	57	18	28
3	0	22	2	3	15	20	2	53	18	27
4	0	30	3	3	18	20	2	49	17	26
5	0	37	4	3	21	21	2	44	17	25
6	0	45	4	3	24	21	2	39	16	24
7	0	52	5	3	26	21	2	34	16	23
8	0	59	6	3	28	21	2	29	15	22
9	1	6	7	3	29	21	2	23	15	21
10	1	13	8	3	31	22	2	18	14	20
11	1	20	8	3	32	22	2	12	14	19
12	1	27	9	3	33	22	2	6	13	18
13	1	34	10	3	33	22	2	0	12	17
14	1	40	10	3	34	22	1	53	12	16
15	1	47	11	3	34	22	1	47	11	15
16	1	53	12	3	34	22	1	40	10	14
17	2	0	12	3	33	22	1	34	10	13
18	2	6	13	3	33	22	1	27	9	12
19	2	12	14	3	32	22	1	20	8	11
20	2	18	14	3	31	22	1	13	8	10
21	2	23	15	3	29	21	1	6	7	9
22	2	29	15	3	28	21	0	59	6	8
23	2	34	16	3	26	21	0	52	5	7
24	2	39	16	3	24	21	0	45	4	6
25	2	44	17	3	21	21	0	37	4	5
26	2	49	17	3	18	20	0	30	3	4
27	2	53	18	3	15	20	0	22	2	3
28	2	57	18	3	12	20	0	15	1	2
29	3	1	19	3	9	19	0	7	1	1
30	3	5	19	3	5	19	0	0	0	0
Sign.	11	5		10	4		9	3		Sig
	A D D.									

DECIMAL MULTIPLIERS *to the* Increment *in the Second Equation Table of* ☽.

☉ Mean Anomaly. Sign.	0	1	2	3	4	5	☉ Mean Anomaly. Sign.
0	.000	.068	.273	.5	.773	.955	30
1	.002	.072	.28	.508	.780	.957	29
2	.004	.076	.288	.515	.789	.96	28
3	.006	.08	.296	.523	.795	.962	27
4	.008	.084	.303	.53	.803	.965	26
5	.01	.087	311	.538	.811	.967	25
6	.011	.091	.318	.545	.818	.97	24
7	.013	.098	.326	.553	.822	.972	23
8	.015	.106	.333	.561	.826	.975	22
9	.017	.114	.341	.568	.83	.977	21
10	.019	.121	.348	.576	.833	.98	20
11	.021	.129	.356	.583	.837	.982	19
12	.023	.136	.364	.591	.841	.985	18
13	.025	.144	.371	.599	.845	.987	17
14	.027	.152	.379	.606	.848	.99	16
15	.029	.159	.386	.614	.852	.992	15
16	.031	.167	.394	.621	.856	.995	14
17	.032	.174	.401	.629	.86	.997	13
18	.034	.182	.409	.636	.864	1.—	12
19	.036	.189	.417	.648	.871	1.—	11
20	.038	.197	.424	.659	.879	1.—	10
21	.04	.205	.432	.671	.886	1.—	9
22	.042	.212	.439	.682	.894	1.—	8
23	.044	.22	.447	.693	.901	1.—	7
24	.046	.227	.455	.705	.909	1.—	6
25	.049	.235	.462	.716	.917	1.—	5
26	.052	.243	.47	.728	.924	1.—	4
27	.057	.25	.477	.739	.932	1.—	3
28	.061	.258	.485	.75	.939	1.—	2
29	.065	.265	.492	.762	.947	1.—	1
30	.068	.273	.5	.773	.955	1.—	0
Sign.	11	10	9	8	7	6	Sign.

☉ Mean Anomaly.

TABLE *of the Third Equation of the* MOON. (*According to Sir* ISAAC NEWTON.)

☉ ~ ☊ ⌒	ADD.			☉ ~ ☊ ⌒
	Signs. 0 6	Signs. 1 7	Signs. 2 8	
°	″	″	″	°
0	0	41	41	30
1	2	41	40	29
2	3	42	39	28
3	5	43	38	27
4	6	44	37	26
5	8	44	36	25
6	10	45	35	24
7	11	45	34	23
8	13	46	33	22
9	15	46	31	21
10	16	46	30	20
11	18	47	29	19
12	19	47	27	18
13	20	47	26	17
14	22	47	25	16
15	23	47	23	15
16	25	47	22	14
17	26	47	20	13
18	27	47	19	12
19	29	47	18	11
20	30	46	16	10
21	31	46	15	9
22	33	46	13	8
23	34	45	11	7
24	35	45	10	6
25	36	44	8	5
26	37	44	6	4
27	38	43	5	3
28	39	42	3	2
29	40	41	2	1
30	41	41	0	0
Sign.	11 5	10 4	9 3	Sign
	SUBTRACT.			

TABLE *of the Fourth Equation of the* MOON. (*According to Sir* ISAAC NEWTON)

	☉ à ☽ + ☉ Apo. à ☽ Apo.						
Sign.	0	S.	1	S.	2	S.	Sign.
Sign.	6	A.	7	A.	8	A.	Sign.
°	′	″	′	″	′	″	°
0	0	0	1	12	2	5	30
1	0	2	1	15	2	7	29
2	0	5	1	17	2	8	28
3	0	7	1	19	2	9	27
4	0	10	1	21	2	10	26
5	0	12	1	23	2	11	25
6	0	15	1	25	2	12	24
7	0	17	1	27	2	13	23
8	0	20	1	29	2	14	22
9	0	22	1	31	2	15	21
10	0	25	1	33	2	16	20
11	0	27	1	35	2	17	19
12	0	30	1	37	2	17	18
13	0	32	1	39	2	18	17
14	0	35	1	41	2	19	16
15	0	37	1	43	2	20	15
16	0	40	1	44	2	20	14
17	0	42	1	46	2	21	13
18	0	44	1	48	2	21	12
19	0	46	1	49	2	22	11
20	0	49	1	51	2	22	10
21	0	51	1	52	2	23	9
22	0	54	1	54	2	23	8
23	0	56	1	55	2	24	7
24	0	59	1	57	2	24	6
25	1	1	1	58	2	24	5
26	1	3	2	0	2	24	4
27	1	5	2	1	2	25	3
28	1	8	2	3	2	25	2
29	1	10	2	4	2	25	1
30	1	12	2	5	2	25	0
Sign.	11	A.	10	A.	9	A.	Sign.
Sign.	5	S.	4	S.	3	S.	Sign.

TABLE *of the Second Equation of the* MOON's Apogé.
(*According to Sir* ISAAC NEWTON.)

☽ Apo. à ☉	ADD.									☽ Apo. à ☉
	Signs. 0		6	Signs. 1		7	Signs. 2		8	
°	°	′	″	°	′	″	°	′	″	°
0	0	0	0	9	27	57	11	40	0	30
1	0	21	4	9	42	12	11	30	39	29
2	0	42	8	9	55	58	11	20	14	28
3	1	3	10	10	9	14	11	8	44	27
4	1	24	9	10	21	58	10	56	8	26
5	1	45	5	10	34	9	10	42	26	25
6	2	5	57	10	45	47	10	27	38	24
7	2	26	44	10	56	49	10	11	45	23
8	2	47	25	11	7	15	9	54	47	22
9	3	8	0	11	17	4	9	36	44	21
10	3	28	27	11	26	14	9	17	37	20
11	3	48	46	11	34	43	8	57	25	19
12	4	8	55	11	42	31	8	36	11	18
13	4	28	54	11	49	36	8	13	56	17
14	4	48	42	11	55	57	7	50	42	16
15	5	8	19	12	1	33	7	26	29	15
16	5	27	43	12	6	22	7	1	21	14
17	5	46	53	12	10	23	6	35	19	13
18	6	5	45	12	13	35	6	8	26	12
19	6	24	27	12	15	56	5	40	45	11
20	6	42	50	12	17	24	5	12	18	10
21	7	0	56	12	17	59	4	43	10	9
22	7	18	44	12	17	40	4	13	23	8
23	7	36	12	12	16	25	3	43	1	7
24	7	53	20	12	14	13	3	12	9	6
25	8	10	6	12	11	2	2	40	49	5
26	8	26	29	12	6	52	2	9	7	4
27	8	42	29	12	1	42	1	37	6	3
28	8	58	5	11	55	31	1	4	52	2
29	9	13	15	11	48	17	0	32	28	1
30	9	27	57	11	40	0	0	0	0	0
Sign.	1		5	10		4	9		3	Sign.
	SUBTRACT.									

TABLE of the Firſt Equation of the MOON. (According to Mr. MACHIN.)

Ano.	ADD.												☉ Me. Ano.
ign.	0		1		2		3		4		5		Sign.
°	′	″	′	″	′	″	′	″	′	″	′	″	°
0	0	0	5	56	10	22	12	6	10	35	6	10	30
1	0	12	6	7	10	28	12	6	10	29	5	58	29
2	0	25	6	18	10	35	12	6	10	23	5	4	28
3	0	37	6	28	10	41	12	5	10	16	5	35	27
4	0	50	6	39	10	46	12	5	10	9	5	24	26
5	1	2	6	49	10	52	12	4	10	2	5	13	25
6	1	14	7	0	10	57	12	3	9	55	5	1	24
7	1	27	7	10	11	3	12	2	9	48	4	49	23
8	1	39	7	20	11	8	12	1	9	40	4	37	22
9	1	51	7	29	11	12	11	59	9	32	4	25	21
10	2	3	7	39	11	17	11	57	9	24	4	13	20
11	2	16	7	49	11	22	11	55	9	16	4	1	19
12	2	28	7	58	11	26	11	53	9	7	3	49	18
13	2	40	8	7	11	30	11	51	8	59	3	36	17
14	2	52	8	17	11	34	11	48	8	50	3	24	16
15	3	4	8	26	11	37	11	45	8	41	3	12	15
16	3	16	8	35	11	41	11	42	8	32	2	59	14
17	3	28	8	43	11	44	11	38	8	23	2	47	13
18	3	40	8	52	11	47	11	35	8	14	2	34	12
19	3	52	9	0	11	50	11	31	8	4	2	21	11
20	4	3	9	9	11	52	11	27	7	54	2	9	10
21	4	15	9	17	11	54	11	23	7	44	1	56	9
22	4	27	9	25	11	57	11	18	7	34	1	43	8
23	4	38	9	32	11	59	11	14	7	24	1	30	7
24	4	50	9	40	12	0	11	9	7	14	1	17	6
25	5	1	9	47	12	2	11	4	7	4	1	5	5
26	5	12	9	55	12	3	10	58	6	53	0	52	4
27	5	23	10	2	12	4	10	5[illegible]	6	43	0	39	3
28	5	34	10	9	12	5	10	4	6	32	0	26	2
29	5	45	10	15	12	5	10	41	6	21	0	13	1
30	5	56	10	22	12	6	10	3	6	10	0	0	0
gn.	11		10		9		8		7		6		Sign.
M.A.	SUBTRACT.												☉ M.A.

TABLE *of the Firſt Equation of the* MOON's Apoge.
(*According to Mr.* MACHIN.)

⊙ *M. A.* Sign.	SUBTRACT. 0		1		2		3		4		5	
°	′	″	′	″	′	″	′	″	′	″	′	″
0	0	0	10	47	18	48	21	56	19	12	11	11
1	0	22	11	6	19	0	21	57	19	1	10	50
2	0	44	11	25	19	11	21	56	18	49	10	30
3	1	7	11	44	19	22	21	56	18	37	10	9
4	1	30	12	3	19	33	21	56	18	24	9	48
5	1	52	12	22	19	43	21	54	18	11	9	27
6	2	14	12	41	19	54	21	52	17	58	9	6
7	2	37	12	59	20	2	21	50	17	45	8	45
8	2	59	13	18	20	11	21	46	17	31	8	23
9	3	22	13	36	20	20	21	44	17	17	8	1
10	3	44	13	53	20	28	21	42	17	3	7	39
11	4	6	14	10	20	36	21	38	16	48	7	17
12	4	28	14	27	20	44	21	34	16	33	6	55
13	4	50	14	44	20	51	21	29	16	17	6	33
14	5	13	15	1	20	58	21	24	16	1	6	10
15	5	34	15	18	21	4	21	19	15	45	5	48
16	5	56	15	35	21	11	21	13	15	29	5	25
17	6	17	15	49	21	17	21	7	15	12	5	2
18	6	39	16	5	21	22	21	0	14	55	4	39
19	7	0	16	20	21	27	20	54	14	38	4	16
20	7	22	16	35	21	32	20	46	14	20	3	53
21	7	43	16	50	21	36	20	38	14	2	3	30
22	8	4	17	4	21	40	20	30	13	44	3	7
23	8	25	17	18	21	43	20	22	13	26	2	4
24	8	45	17	32	21	46	20	13	13	7	2	20
25	9	5	17	46	21	49	20	4	12	48	1	5
26	9	26	17	59	21	52	19	54	12	29	1	3
27	9	47	18	11	21	53	19	44	12	10	1	1
28	10	7	18	24	21	54	19	34	11	50	0	4
29	0	27	18	36	21	56	19	23	11	31	0	21
30	0	47	18	48	21	56	19	12	11	11	0	0
Sign.	11		10		9		8		7		6	
⊙ *M. A.*	ADD.											

ABLE *of the Firſt Equation of the* MOON'*s* Node ☊.
(*According to Mr* MACHIN.)

ADD.												☉ *Mc. Ano.*
0		1		2		3		4		5		Sign.
′	″	′	″	′	″	′	″	′	″	′	″	°
0	0	4	23	7	39	8	56	7	49	4	33	30
0	9	4	31	7	44	8	56	7	44	4	25	29
0	18	4	39	7	48	8	56	7	39	4	16	28
0	28	4	47	7	53	8	56	7	34	4	7	27
0	37	4	54	7	57	8	55	7	30	3	58	26
0	46	5	2	8	2	8	55	7	24	3	51	25
0	55	5	10	8	6	8	54	7	19	3	42	24
1	4	5	17	8	10	8	53	7	13	3	33	23
1	13	5	25	8	13	8	52	7	7	3	24	22
1	22	5	32	8	17	8	51	7	1	3	16	21
1	31	5	39	8	20	8	50	6	56	3	7	20
1	40	5	46	8	23	8	48	6	50	2	58	19
1	49	5	53	8	26	8	46	6	44	2	49	18
1	58	6	0	8	29	8	44	6	38	2	40	17
2	7	6	7	8	32	8	42	6	31	2	31	16
2	16	6	13	8	35	8	40	6	25	2	22	15
2	25	6	20	8	37	8	38	6	18	2	13	14
2	34	6	26	8	40	8	36	6	11	2	3	13
2	42	6	33	8	42	8	33	6	4	1	54	12
2	51	6	39	8	44	8	30	5	57	1	45	11
3	0	6	45	8	46	8	27	5	50	1	35	10
3	8	6	51	8	48	8	24	5	43	1	25	9
3	17	6	57	8	49	8	21	5	36	1	15	8
3	25	7	3	8	50	8	18	5	28	1	6	7
3	34	7	8	8	52	8	14	5	20	0	57	6
3	42	7	14	8	53	8	10	5	12	0	47	5
3	51	7	19	8	54	8	6	5	4	0	37	4
3	59	7	24	8	54	8	2	4	56	0	28	3
4	7	7	29	8	55	7	58	4	48	0	19	2
4	15	7	34	8	55	7	54	4	41	0	9	1
4	23	7	39	8	56	7	49	4	33	0	0	0
11		10		9		8		7		6.		Sign.
SUBTRACT.												

TABLE *of the Second Equation of the* MOON's *Apoge.*
(*According to Mr.* MACHIN.)

☽ Apo. à ☉	ADD.									☽ Apo. à ☉
Sign.	0		6	1		7	2		8	Sig.
°	°	′	″	°	′	″	°	′	″	°
0	0	0	0	9	28	24	11	40	42	30
1	0	21	5	9	42	40	11	31	21	29
2	0	42	10	9	56	27	11	20	56	28
3	1	3	13	10	9	43	11	9	25	27
4	1	24	13	10	22	28	10	56	48	26
5	1	45	10	10	34	40	10	43	8	25
6	2	6	3	10	46	19	10	28	18	24
7	2	26	51	10	57	22	10	12	25	23
8	2	47	33	11	7	48	9	55	25	22
9	3	8	8	11	17	38	9	37	21	21
10	3	28	36	11	26	49	9	18	11	20
11	3	48	56	11	35	19	8	58	5	19
12	4	9	6	11	43	8	8	36	44	18
13	4	29	6	11	50	14	8	14	28	17
14	4	48	55	11	56	35	7	51	12	16
15	5	8	33	12	2	12	7	27	0	15
16	5	27	57	12	7	1	7	1	50	14
17	5	47	8	12	11	3	6	35	45	13
18	6	6	4	12	14	15	6	18	51	12
19	6	24	45	12	16	35	5	41	8	11
20	6	43	9	12	18	4	5	12	40	10
21	7	1	16	12	18	40	4	43	28	9
22	7	19	4	12	18	21	4	13	40	8
23	7	36	33	12	17	6	3	43	16	7
24	7	53	42	12	14	54	3	12	22	6
25	8	10	29	12	11	44	2	41	0	5
26	8	26	53	12	7	35	2	9	16	4
27	8	42	54	12	2	24	1	37	13	3
28	8	58	30	11	56	12	1	4	56	2
29	9	13	41	11	49	0	0	32	30	1
30	9	28	24	11	40	42	0	0	0	0
Sign.	11		5	0		4	9		3	Sg
	SUBTRACT.									

TABLE of the Mean Elliptic Equation of the MOON.

SUBTRACT.
MEAN ANOMALY.

Sign.	0			1			2			Sign.
°	°	′	″	°	′	″	°	′	″	°
0	0	0	0	3	0	36	5	18	47	30
1	0	6	16	3	6	7	5	22	12	29
2	0	12	31	3	11	35	5	25	32	28
3	0	18	46	3	17	0	5	28	46	27
4	0	25	2	3	22	22	5	31	55	26
5	0	31	16	3	27	40	5	34	58	25
6	0	37	30	3	32	55	5	37	56	24
7	0	43	44	3	38	7	5	40	48	23
8	0	49	57	3	43	16	5	43	34	22
9	0	56	10	3	48	20	5	46	14	21
10	1	2	21	3	53	22	5	48	48	20
11	1	8	31	3	58	19	5	51	16	19
12	1	14	40	4	3	12	5	53	38	18
13	1	20	48	4	8	2	5	55	54	17
14	1	26	55	4	12	48	5	58	4	16
15	1	33	0	4	17	30	6	0	8	15
16	1	39	5	4	22	7	6	2	6	14
17	1	45	7	4	26	40	6	3	56	13
18	1	51	8	4	31	9	6	5	42	12
19	1	57	7	4	35	33	6	7	20	11
20	2	3	4	4	39	53	6	8	52	10
21	2	9	0	4	44	8	6	10	17	9
22	2	14	53	4	48	18	6	11	36	8
23	2	20	44	4	52	24	6	12	48	7
24	2	26	34	4	56	26	6	13	54	6
25	2	32	20	5	0	22	6	14	53	5
26	2	38	4	5	4	13	6	15	46	4
27	2	43	45	5	8	0	6	16	31	3
28	2	49	25	5	11	40	6	17	10	2
29	2	55	2	5	15	16	6	17	42	1
30	3	0	36	5	18	47	6	18	7	0
Sign.	11			10			9			Sig

ADD.
MEAN ANOMALY.

TABLE *of the Mean Elliptic Equation of the* MOON.

SUBTRACT.
MEAN ANOMALY.

Sign.	3			4			5			Sign.
°	°	′	″	°	′	″	°	′	″	°
0	6	18	7	5	36	48	3	18	40	30
1	6	18	25	5	33	38	3	12	44	29
2	6	18	36	5	30	22	3	6	44	28
3	6	18	41	5	27	0	3	0	49	27
4	6	18	39	5	23	31	2	54	32	26
5	6	18	30	5	19	56	2	48	20	25
6	6	18	13	5	16	14	2	42	4	24
7	6	17	50	5	12	25	2	35	46	23
8	6	17	20	5	8	31	2	29	24	22
9	6	16	42	5	4	30	2	22	58	21
10	6	15	58	5	0	24	2	16	30	20
11	6	15	7	4	56	10	2	9	59	19
12	6	14	8	4	51	52	2	3	25	18
13	6	13	3	4	47	27	1	56	48	17
14	6	11	51	4	42	56	1	50	9	16
15	6	10	31	4	38	19	1	43	28	15
16	6	9	3	4	33	37	1	36	44	14
17	6	7	32	4	28	50	1	29	58	13
18	6	5	52	4	23	56	1	23	10	12
19	6	4	4	4	18	58	1	16	21	11
20	6	2	9	4	13	54	1	9	30	10
21	6	0	8	4	8	44	1	2	37	9
22	5	58	0	4	3	30	0	55	43	8
23	5	55	45	3	58	10	0	48	48	7
24	5	53	23	3	52	46	0	41	51	6
25	5	50	54	3	47	16	0	34	54	5
26	5	48	18	3	41	52	0	27	56	4
27	5	45	36	3	36	3	0	20	58	3
28	5	42	47	3	30	20	0	13	59	2
29	5	39	50	3	24	32	0	7	0	1
30	5	36	48	3	18	40	0	0	0	0
Sign.	8			7			6			Sign.

ADD.
MEAN ANOMALY.

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

Mean Anomaly 0 Signs.

Apoge ☽ 1° Tr. equat. a ☉	0°	1°			2°			3°			4°			5°			6°			7°			8°			9°			Apoge ☽ 1° Tr. equat. a ☉
	A.	A.			A.			A.			A.			A.			A.			A.			A.			A.			
°		°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	d
0	0	0	1	8	0	2	17	0	3	25	0	4	33	0	5	40	0	6	48	0	7	56	0	9	4	0	10	12	0
2	0	0	1	8	0	2	16	0	3	24	0	4	32	0	5	39	0	6	47	0	7	55	0	9	2	0	10	10	2
4	0	0	1	8	0	2	15	0	3	23	0	4	30	0	5	37	0	6	45	0	7	52	0	8	59	0	10	6	4
6	0	0	1	7	0	2	14	0	3	21	0	4	27	0	5	34	0	6	40	0	7	47	0	8	53	0	10	0	6
8	0	0	1	6	0	2	11	0	3	17	0	4	23	0	5	29	0	6	35	0	7	40	0	8	46	0	9	51	8
10	0	0	1	4	0	2	9	0	3	13	0	4	18	0	5	22	0	6	27	0	7	31	0	8	35	0	9	39	10
12	0	0	1	3	0	2	6	0	3	9	0	4	12	0	5	15	0	6	18	0	7	20	0	8	23	0	9	25	12
14	0	0	1	1	0	2	2	0	3	3	0	4	4	0	5	6	0	6	7	0	7	8	0	8	8	0	9	9	14
16	0	0	0	59	0	1	59	0	2	58	0	3	57	0	4	56	0	5	55	0	6	53	0	7	25	0	8	50	16
18	0	0	0	57	0	1	53	0	2	50	0	3	47	0	4	45	0	5	42	0	6	38	0	7	33	0	8	29	18
20	0	0	0	54	0	1	48	0	2	42	0	3	37	0	4	31	0	5	26	0	6	19	0	7	12	0	8	5	20
22	0	0	0	51	0	1	42	0	2	33	0	3	26	0	4	18	0	5	11	0	6	0	0	6	50	0	7	39	22
24	0	0	0	48	0	1	36	0	2	24	0	3	13	0	4	2	0	4	51	0	5	38	0	6	25	0	7	12	24
26	0	0	0	45	0	1	30	0	2	15	0	3	0	0	3	46	0	4	31	0	5	14	0	5	58	0	6	41	26
28	0	0	0	41	0	1	22	0	2	3	0	2	45	0	3	28	0	4	10	0	4	50	0	5	29	0	6	9	28
30	0	0	0	39	0	1	10	0	1	58	0	2	35	0	3	11	0	3	48	0	4	23	0	4	59	0	5	34	30
32	0	0	0	33	0	1	6	0	1	39	0	2	14	0	2	48	0	3	23	0	3	55	0	4	26	0	4	58	32
31	0	0	0	29	0	0	57	0	1	26	0	1	56	0	2	27	0	2	57	0	3	25	0	3	53	0	4	21	34
36	0	0	0	24	0	0	49	0	1	13	0	1	30	0	2	5	0	2	11	0	2	51	0	3	18	0	3	41	36

42	0	0 0 11	0 0 21	0 0 32	0 0 43	0 0 54	0 1 5	0 1 15	0 1 24	0 1 34	42
44	0	0 0 6	0 0 11	0 0 17	0 0 23	0 0 29	0 0 35	0 0 40	0 0 44	0 0 49	44
46	0	0 0 1	0 0 1	0 0 2	0 0 3	0 0 4	0 0 5	0 0 5	0 0 4	0 0 4	46
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
48	0	0 0 4	0 0 9	0 0 13	0 0 18	0 0 22	0 0 27	0 0 32	0 0 37	0 0 42	48
50	0	0 0 9	0 0 19	0 0 28	0 0 38	0 0 47	0 0 57	0 1 8	0 1 18	0 1 29	50
52	0	0 0 14	0 0 29	0 0 43	0 0 58	0 1 14	0 1 29	0 1 44	0 2 0	0 2 15	52
54	0	0 0 20	0 0 39	0 0 59	0 1 19	0 1 40	0 2 0	0 2 21	0 2 41	0 3 2	54
56	0	0 0 25	0 0 50	0 1 15	0 1 40	0 2 5	0 2 30	0 2 56	0 3 21	0 3 47	56
58	0	0 0 30	0 1 0	0 1 30	0 2 0	0 2 31	0 3 1	0 3 32	0 4 2	0 4 33	58
60	0	0 0 35	0 1 10	0 1 45	0 2 20	0 2 56	0 3 31	0 4 7	0 4 42	0 5 18	60
62	0	0 0 40	0 1 20	0 2 0	0 2 40	0 3 21	0 4 1	0 4 41	0 5 22	0 6 2	62
64	0	0 0 45	0 1 30	0 2 15	0 3 0	0 3 45	0 4 30	0 5 15	0 6 0	0 6 45	64
66	0	0 0 50	0 1 39	0 2 29	0 3 19	0 4 8	0 4 58	0 5 47	0 6 37	0 7 26	66
68	0	0 0 54	0 1 47	0 2 41	0 3 36	0 4 31	0 5 26	0 6 19	0 7 12	0 8 5	68
70	0	0 0 58	0 2 56	0 2 54	0 3 53	0 4 52	0 5 51	0 6 48	0 7 45	0 8 42	70
72	0	0 1 2	0 2 4	0 3 6	0 4 9	0 5 12	0 6 15	0 7 16	0 8 16	0 9 17	72
74	0	0 1 6	0 2 11	0 3 17	0 4 24	0 5 30	0 6 37	0 7 41	0 8 44	0 9 48	74
76	0	0 1 9	0 2 18	0 3 27	0 4 37	0 5 46	0 6 56	0 8 3	0 9 10	0 10 17	76
78	0	0 1 11	0 2 23	0 3 34	0 4 48	0 6 1	0 7 15	0 8 24	0 9 34	0 10 43	78
80	0	0 1 14	0 2 28	0 3 42	0 4 58	0 6 14	0 7 30	0 8 41	0 9 53	0 11 4	80
82	0	0 1 16	0 2 32	0 3 48	0 5 6	0 6 24	0 7 42	0 8 55	0 10 9	0 11 22	82
84	0	0 1 18	0 2 35	0 3 53	0 5 13	0 6 32	0 7 52	0 9 7	0 10 22	0 11 37	84
86	0	0 1 19	0 2 37	0 3 56	0 5 17	0 6 38	0 7 59	0 9 15	0 10 32	0 11 48	86
88	0	0 1 19	0 2 39	0 3 58	0 5 19	0 6 41	0 8 2	0 9 19	0 10 35	0 11 52	88
90	0	0 1 20	0 2 40	0 4 0	0 5 22	0 6 43	0 8 5	0 9 22	0 10 39	0 11 56	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

Mean Anomaly 0 Signs.

Apoge ☽ 1° 11. equat. à ☉.	10°			11°			12°			13°			14°			15°			16°			17°			18°			19°			Apoge ☽ 1° 11. equat. à ☉.
	A.			A.			A.			A.			A.			A.			A.			A.			A.			A.			
°	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°
0	0	11	20	0	12	27	0	13	35	0	14	42	0	15	50	0	16	57	0	18	3	0	19	10	0	20	16	0	21	22	0
2	0	11	18	0	12	25	0	13	33	0	14	40	0	15	47	0	16	54	0	18	0	0	19	6	0	20	12	0	21	18	2
4	0	11	13	0	12	21	0	13	28	0	14	34	0	15	41	0	16	47	0	17	53	0	18	59	0	20	5	0	21	10	4
6	0	11	7	0	12	13	0	13	20	0	14	26	0	15	31	0	16	37	0	17	42	0	18	48	0	19	53	0	20	58	6
8	0	10	57	0	12	2	0	13	8	0	14	13	0	15	17	0	16	22	0	17	26	0	18	30	0	19	34	0	20	38	8
10	0	10	43	0	11	48	0	12	52	0	13	56	0	14	59	0	16	3	0	17	6	0	18	9	0	19	12	0	20	14	10
12	0	10	28	0	11	30	0	12	33	0	13	35	0	14	37	0	15	39	0	16	41	0	17	42	0	18	44	0	19	45	12
14	0	10	10	0	11	10	0	12	11	0	13	11	0	14	12	0	15	12	0	16	12	0	17	11	0	18	11	0	19	10	14
16	0	9	48	0	10	47	0	11	45	0	12	43	0	13	41	0	14	39	0	15	37	0	16	34	0	17	32	0	18	29	16
18	0	9	25	0	10	22	0	11	18	0	12	14	0	13	10	0	14	6	0	15	1	0	15	57	0	16	52	0	17	47	18
20	0	8	58	0	9	52	0	10	45	0	11	38	0	12	32	0	13	25	0	14	18	0	15	10	0	16	3	0	16	56	20
22	0	8	30	0	9	20	0	10	11	0	11	1	0	11	52	0	12	42	0	13	32	0	13	22	0	15	12	0	16	2	22
24	0	7	59	0	8	47	0	9	34	0	10	22	0	11	10	0	11	58	0	12	45	0	13	31	0	14	18	0	15	5	24
26	0	7	25	0	8	8	0	8	52	0	9	36	0	10	21	0	11	5	0	11	48	0	12	32	0	13	15	0	13	59	26
28	0	6	49	0	7	29	0	8	9	0	8	59	0	9	32	0	10	13	0	10	53	0	11	32	0	12	12	0	12	54	28
30	0	6	10	0	6	47	0	7	23	0	8	0	0	8	37	0	9	14	0	9	50	0	10	27	0	11	3	0	11	40	30
32	0	5	31	0	6	3	0	6	30	0	7	9	0	7	42	0	8	15	0	8	47	0	9	20	0	9	52	0	10	25	32
34	0	4	49	0	5	18	0	5	46	0	6	15	0	6	44	0	7	13	0	7	41	0	8	10	0	8	38	0	9	7	34
36	0	4	5	0	4	30	0	4	54	0	5	18	0	5	41	0	6	[illegible]	0	6	31	0	6	56	0	7	20	0	7	44	36

42	0 1 44	0 1 54	0 2 4	0 2 15	0 2 20	0 2 [illegible]	0 2 40	[illegible]	[illegible]	[illegible]	[illegible]
44	0 0 55	0 1 0	0 1 6	0 1 12	0 1 17	0 1 23	0 1 29	0 1 35	0 1 41	0 1 47	44
46	0 0 4	0 0 5	0 0 5	0 0 6	0 0 8	0 0 9	0 0 10	0 0 11	0 0 12	0 0 13	46
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
48	9 0 47	0 0 51	0 0 56	0 1 0	0 1 3	0 1 7	0 1 11	0 1 16	0 1 20	0 1 24	48
50	0 1 38	0 1 48	0 1 57	0 2 6	0 2 16	0 2 25	0 2 34	0 2 44	0 2 53	0 3 1	50
52	0 2 29	0 2 44	0 2 58	0 3 13	0 3 27	0 3 42	0 3 56	0 4 10	0 4 24	0 4 38	52
54	0 3 22	0 3 51	0 4 1	0 4 20	0 4 40	0 5 0	0 5 19	0 5 37	0 5 56	0 6 15	54
56	0 4 12	0 4 37	0 5 2	0 5 27	0 5 52	0 6 17	0 6 41	0 7 4	0 7 28	0 7 52	56
58	0 5 3	0 5 32	0 6 2	0 6 32	0 7 3	0 7 33	0 8 1	0 8 29	0 8 57	0 9 26	58
60	0 5 53	0 6 27	0 7 2	0 7 37	0 8 13	0 8 48	0 9 21	0 9 54	0 10 27	0 11 0	60
62	0 6 41	0 7 21	0 8 0	0 8 40	0 9 20	0 10 0	0 10 38	0 11 16	0 11 54	0 12 32	62
64	0 7 29	0 8 13	0 8 57	0 9 42	0 10 26	0 11 11	0 11 53	0 12 36	0 13 18	0 14 1	64
66	0 8 15	0 9 3	0 9 52	0 10 41	0 11 29	0 12 18	0 13 5	0 14 53	0 14 40	0 15 27	66
68	0 8 58	0 9 51	0 10 44	0 11 39	0 12 33	0 13 28	0 14 18	0 15 9	0 15 59	0 16 50	68
70	0 9 39	0 10 36	0 11 33	0 12 30	0 13 27	0 14 24	0 15 20	0 16 16	0 17 12	0 18 7	70
72	0 10 18	0 11 18	0 12 19	0 13 20	0 14 20	0 15 21	0 16 21	0 17 21	0 18 21	0 19 20	72
74	0 10 53	0 11 57	0 13 2	0 14 5	0 15 7	0 16 10	0 17 15	0 18 19	0 19 24	0 20 26	74
76	0 11 25	0 12 33	0 13 41	0 14 47	0 15 54	0 17 0	0 18 7	0 19 14	0 20 21	0 21 26	76
78	0 11 53	0 13 4	0 14 14	0 15 24	0 16 33	0 17 43	0 18 53	0 20 2	0 21 12	0 22 20	78
80	0 12 17	0 13 30	0 14 43	0 15 55	0 16 7	0 18 19	0 19 31	0 20 44	0 21 56	0 23 6	80
82	0 12 37	0 13 53	0 15 8	0 16 22	0 17 35	0 18 49	0 20 3	0 21 17	0 22 31	0 23 43	82
84	0 12 54	0 14 10	0 15 27	0 16 42	0 17 58	0 19 13	0 20 29	0 21 45	0 23 1	0 24 15	84
86	0 13 6	0 14 23	0 15 41	0 16 57	0 18 14	0 19 30	0 20 47	0 22 4	0 23 21	0 24 36	86
88	0 13 11	0 14 30	0 15 49	0 17 6	0 18 23	0 19 40	0 20 58	0 22 15	0 23 33	0 24 49	98
90	0 13 15	0 14 33	0 15 52	0 17 9	0 18 27	0 19 44	0 21 2	0 22 20	0 23 38	0 24 54	0

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

MEAN ANOMALY 0 Signs.

Apoge ☽ 1° Ti. equat. à ☉	20° A.	21° A.	22° A.	23° A.	24° A.	25° A.	26° A.	27° A.	28° A.	29° A.	Apoge ☽ 1° Ti. equat. à ☉
°	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	°
0	0 22 28	0 23 34	0 24 40	0 25 46	0 26 52	0 27 58	0 29 3	0 30 9	0 31 13	0 32 16	0
2	0 22 24	0 23 30	0 24 35	0 25 41	0 26 46	0 27 52	0 28 57	0 30 3	0 31 7	0 32 10	2
4	0 22 16	0 23 21	0 24 26	0 25 31	0 26 36	0 27 41	0 28 47	0 29 52	0 30 55	0 31 59	4
6	0 22 3	0 23 7	0 24 12	0 25 16	0 26 21	0 27 25	0 28 30	0 29 34	0 30 37	0 31 39	6
8	0 21 41	0 22 45	0 23 49	0 24 52	0 25 56	0 27 0	0 28 3	0 29 7	0 30 9	0 31 10	8
10	0 21 15	0 22 17	0 23 20	0 24 23	0 25 26	0 26 28	0 27 30	0 28 32	0 29 33	0 30 33	10
12	0 20 46	0 21 47	0 22 48	0 23 48	0 24 49	0 25 50	0 26 51	0 27 52	0 28 51	0 29 49	12
14	0 20 10	0 21 9	0 22 8	0 23 6	0 24 5	0 25 4	0 26 4	0 27 4	0 28 1	0 28 58	14
16	0 19 26	0 20 23	0 21 20	0 22 17	0 23 14	0 24 11	0 25 9	0 26 6	0 27 2	0 27 57	16
18	0 18 43	0 19 38	0 20 32	0 21 27	0 22 21	0 23 16	0 24 11	0 25 6	0 25 58	0 26 50	18
20	0 17 48	0 18 41	0 19 33	0 20 25	0 21 17	0 22 9	0 23 2	0 23 54	0 24 45	0 25 35	20
22	0 16 52	0 17 42	0 18 31	0 19 19	0 20 8	0 20 58	0 21 48	0 22 38	0 23 26	0 24 14	22
24	0 15 52	0 16 39	0 17 25	0 18 12	0 18 58	0 19 45	0 20 31	0 21 18	0 22 3	0 22 48	24
26	0 14 43	0 15 27	0 16 10	0 16 53	0 17 36	0 18 20	0 19 3	0 19 46	0 20 28	0 21 10	26
28	0 13 33	0 14 13	0 14 52	0 15 32	0 16 11	0 16 51	0 17 30	0 18 10	0 18 49	0 19 28	28
30	0 12 17	0 12 54	0 13 30	0 14 7	0 14 43	0 15 19	0 15 54	0 16 30	0 17 5	0 17 40	30
32	0 10 58	0 11 31	0 12 3	0 12 35	0 13 7	0 13 39	0 14 12	0 14 44	0 15 16	0 15 47	32
34	0 9 35	0 10 4	0 10 29	0 10 55	0 11 20	0 11 51	0 12 23	0 12 54	0 13 22	0 13 50	34
36	0 8 9	0 8 33	0 8 57	0 9 20	0 9 44	0 10 8	0 10 33	0 10 57	0 11 21	0 11 45	36
38	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0 8 58	0 9 12	0 9 37	38

42	0 3 30	0 3 41	0 3 51	0 4 1	0 4 11	0 4 23	0 4 35	0 4 47	0 4 57	0 5 8	42
44	0 1 52	0 1 58	0 2 3	0 2 8	0 2 13	0 2 21	0 2 28	0 2 36	0 2 42	0 2 49	44
46	0 0 13	0 0 14	0 0 15	0 0 15	0 0 16	0 0 19	0 0 23	0 0 26	0 0 27	0 0 27	46
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
48	0 1 28	0 1 32	0 1 36	0 1 40	0 1 44	0 1 46	0 1 48	0 1 50	0 1 54	0 1 57	48
50	0 3 10	0 3 18	0 3 27	0 3 36	0 3 45	0 3 52	0 3 59	0 4 6	0 4 14	0 4 23	50
52	0 4 51	0 5 5	0 5 19	0 5 33	0 5 47	0 5 59	0 6 10	0 6 22	0 6 35	0 6 49	52
54	0 6 34	0 6 53	0 7 12	0 7 30	0 7 49	0 8 6	0 8 22	0 8 39	0 8 57	0 9 15	54
56	0 8 15	0 8 39	0 9 3	0 9 26	0 9 50	0 10 11	0 10 33	0 10 54	0 11 16	0 11 39	56
58	0 9 54	0 10 23	0 10 52	0 11 20	0 11 49	0 12 15	0 12 42	0 13 8	0 13 35	0 14 3	58
60	0 11 34	0 12 7	0 12 40	0 13 14	0 13 47	0 14 18	0 14 49	0 15 20	0 15 51	0 16 23	60
62	0 13 10	0 13 48	0 14 26	0 15 3	0 15 41	0 16 17	0 16 53	0 17 30	0 18 5	0 18 41	62
64	0 14 43	0 15 26	0 16 8	0 16 51	0 17 33	0 18 14	0 18 54	0 19 35	0 20 15	0 20 54	64
66	0 16 14	0 17 1	0 17 48	0 18 34	0 19 21	0 20 5	0 20 50	0 21 34	0 22 19	0 23 3	66
68	0 17 40	0 18 31	0 19 22	0 20 13	0 21 4	0 21 53	0 22 41	0 23 30	0 24 18	0 25 6	68
70	0 19 2	0 19 57	0 20 52	0 21 46	0 22 41	0 23 34	0 24 26	0 25 19	0 26 11	0 27 2	70
72	0 20 18	0 21 17	0 22 15	0 23 14	0 24 12	0 25 8	0 26 4	0 27 0	0 27 56	0 28 51	72
74	0 21 28	0 22 30	0 23 32	0 24 33	0 25 35	0 26 34	0 27 34	0 28 33	0 29 33	0 30 33	74
76	0 22 32	0 23 37	0 24 41	0 25 46	0 26 50	0 27 53	0 28 56	0 29 58	0 31 0	0 32 1	76
78	0 23 28	0 24 36	0 25 43	0 26 50	0 27 57	0 29 2	0 30 8	0 31 13	0 32 17	0 33 21	78
80	0 24 17	0 25 27	0 26 36	0 27 46	0 28 55	0 30 2	0 31 10	0 32 17	0 33 23	0 34 40	80
82	0 24 56	0 26 8	0 27 19	0 28 31	0 29 42	0 30 51	0 32 1	0 33 10	0 34 18	0 35 27	82
84	0 25 29	0 26 42	0 27 55	0 29 8	0 30 21	0 31 32	0 32 43	0 33 54	0 35 4	0 36 13	84
86	0 25 51	0 27 6	0 28 20	0 29 33	0 30 47	0 31 59	0 33 12	0 34 24	0 35 35	0 36 45	86
88	0 26 4	0 27 20	0 28 34	0 29 49	0 31 3	0 32 16	0 33 29	0 34 42	0 35 53	0 37 4	88
90	0 26 10	0 27 26	0 28 41	0 29 55	0 31 10	0 32 23	0 33 36	0 34 49	0 36 1	0 37 12	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

MEAN ANOMALY 1 Sign.

Apogæ ☽ 1° Ti. equat. à ☉.	0°			1°			2°			3°			4°			5°			6°			7°			8°			9°			Apogæ ☽ 1° Ti. equat. à ☉.
	A.			A.			A.			A.			A.			A.			A.			A.			A.			A.			
°	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°
0	0	33	20	0	34	23	0	35	27	0	36	30	0	37	33	0	38	35	0	39	38	0	40	39	0	41	41	0	42	42	0
2	0	33	14	0	34	17	0	35	20	0	36	23	0	37	25	0	38	27	0	39	28	0	40	30	0	41	32	0	42	34	2
4	0	33	2	0	34	5	0	35	7	0	36	10	0	37	12	0	38	14	0	39	16	0	40	17	0	41	18	0	42	19	4
6	0	32	42	0	33	44	0	34	46	0	35	48	0	36	50	0	37	52	0	38	54	0	39	54	0	40	54	0	41	54	6
8	0	32	12	0	33	13	0	34	14	0	35	15	0	36	16	0	37	15	0	38	17	0	39	16	0	40	16	0	41	15	8
10	0	31	34	0	32	34	0	33	33	0	34	33	0	35	33	0	36	33	0	37	33	0	38	31	0	39	29	0	40	27	10
12	0	30	48	0	31	47	0	32	46	0	33	45	0	34	43	0	35	41	0	36	39	0	37	36	0	38	33	0	39	30	12
14	0	29	55	0	30	52	0	31	48	0	32	45	0	33	42	0	34	38	0	35	35	0	36	30	0	37	26	0	38	21	14
16	0	28	53	0	29	48	0	30	43	0	31	38	0	32	31	0	33	26	0	34	22	0	35	16	0	36	9	0	37	3	16
18	0	27	42	0	28	35	0	29	28	0	30	21	0	31	14	0	32	6	0	32	59	0	33	51	0	34	42	0	35	34	18
20	0	26	26	0	27	17	0	28	8	0	28	59	0	29	49	0	30	38	0	31	28	0	32	18	0	33	7	0	33	57	20
22	0	25	2	0	25	50	0	26	37	0	27	25	0	28	13	0	29	1	0	29	49	0	30	36	0	31	23	0	32	10	22
24	0	23	33	0	24	18	0	25	3	0	25	48	0	26	33	0	27	18	0	28	3	0	28	48	0	29	33	0	30	18	24
26	0	21	52	0	22	34	0	23	16	0	23	58	0	24	40	0	25	22	0	26	4	0	26	46	0	27	27	0	28	9	26
28	0	20	7	0	20	46	0	21	24	0	22	3	0	22	42	0	23	20	0	23	59	0	24	38	0	25	17	0	25	56	28
30	0	18	15	0	18	50	0	19	26	0	20	2	0	20	37	0	21	12	0	21	47	0	22	23	0	22	59	0	23	35	30
32	0	16	19	0	16	51	0	17	22	0	17	54	0	18	26	0	18	57	0	19	29	0	20	0	0	20	31	0	21	2	32
34	0	14	18	0	14	45	0	15	13	0	15	40	0	16	09	0	16	37	0	17	6	0	17	33	0	18	0	0	18	27	34

42	0 5 18	0 5 28	0 5 38	0 5 48	0 [illegible] 1	0 [illegible] 13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
44	0 2 55	0 3 01	0 3 6	0 3 12	0 3 20	0 3 27	0 3 35	0 3 42	0 3 49	0 3 56	44
46	0 0 28	0 0 29	0 0 31	0 0 32	0 0 35	0 0 39	0 0 42	0 0 45	0 0 48	0 0 50	46
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
48	0 2 1	0 2 4	0 2 7	0 2 10	0 2 12	0 2 13	0 2 15	0 2 17	0 2 18	0 2 20	48
50	0 4 31	0 4 38	0 4 46	0 4 53	0 4 59	0 5 5	0 5 11	0 5 17	0 5 24	0 5 30	50
52	0 7 2	0 7 14	0 7 26	0 7 38	0 7 49	0 8 0	0 8 10	0 8 21	0 8 32	0 8 43	52
54	0 9 33	0 9 50	0 10 6	0 10 23	0 10 38	0 10 53	0 11 8	0 11 23	0 11 39	0 11 54	54
56	0 12 1	0 12 22	0 12 44	0 13 5	0 13 25	0 13 45	0 14 5	0 14 25	0 14 44	0 15 4	56
58	0 14 30	0 14 55	0 15 21	0 15 46	0 16 11	0 16 35	0 17 0	0 17 24	0 17 48	0 18 12	58
60	0 16 54	0 17 26	0 17 57	0 18 26	0 18 54	0 19 23	0 19 51	0 20 20	0 20 48	0 21 17	60
62	0 19 16	0 19 51	0 20 26	0 21 1	0 21 34	0 22 6	0 22 39	0 23 12	0 23 44	0 24 17	62
64	0 21 34	0 22 13	0 22 51	0 23 30	0 24 7	0 24 44	0 25 21	0 25 58	0 26 35	0 27 12	64
66	0 23 48	0 24 30	0 25 12	0 25 54	0 26 37	0 27 19	0 28 2	0 28 42	0 29 21	0 30 1	66
68	0 25 54	0 26 40	0 27 25	0 28 11	0 28 58	0 29 44	0 30 31	0 31 15	0 31 58	0 32 42	68
70	0 27 54	0 28 43	0 29 32	0 30 21	0 31 12	0 32 2	0 32 53	0 33 40	0 34 28	0 35 15	70
72	0 29 47	0 30 38	0 31 30	0 32 21	0 33 16	0 34 11	0 35 6	0 35 56	0 36 46	0 37 36	72
74	0 31 33	0 32 26	0 33 20	0 34 13	0 35 11	0 36 10	0 37 8	0 38 1	0 38 54	0 39 47	74
76	0 33 3	0 33 59	0 34 56	0 35 52	0 36 54	0 37 56	0 38 58	0 39 54	0 40 49	0 41 45	76
78	0 34 25	0 35 24	0 36 24	0 37 22	0 38 26	0 39 31	0 40 35	0 41 33	0 42 31	0 43 29	78
80	0 35 36	0 36 37	0 37 38	0 38 39	0 39 46	0 40 53	0 42 9	0 43 9	0 43 59	0 44 59	80
82	0 36 35	0 37 38	0 38 40	0 39 43	0 40 52	0 42 2	0 43 11	0 44 12	0 45 12	0 46 13	82
84	0 37 23	0 38 27	0 39 31	0 40 34	0 41 45	0 42 55	0 44 6	0 45 8	0 46 11	0 47 13	84
86	0 37 56	0 39 01	0 40 6	0 41 11	0 42 23	0 43 34	0 44 46	0 45 50	0 46 53	0 47 57	86
88	0 38 15	0 39 24	0 40 33	0 41 42	0 42 51	0 44 0	0 45 9	0 46 13	0 47 17	0 48 21	88
90	0 38 24	0 39 34	0 40 44	0 41 54	0 43 2	0 44 10	0 45 17	0 46 22	0 47 28	0 48 33	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

MEAN ANOMALY 1 Sign.

Apogé ☽ 1° Ti. equat. à ☉	10°			11°			12°			13°			14°			15°			16°			17°			18°			19°			Apogé ☽ 1° Ti. equat. à ☉
	A.			A.			A.			A.			A.			A.			A.			A.			A.			A.			
°	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°
0	0	43	42	0	44	42	0	45	42	0	46	41	0	47	40	0	48	39	0	49	36	0	50	34	0	51	31	0	52	27	0
2	0	43	34	0	44	33	0	45	33	0	46	32	0	47	31	0	48	30	0	49	27	0	50	24	0	51	21	0	52	17	2
4	0	43	19	0	44	18	0	45	17	0	46	16	0	47	14	0	48	13	0	49	10	0	50	6	0	51	3	0	51	58	4
6	0	42	53	0	43	51	0	44	50	0	45	48	0	46	46	0	47	44	0	48	40	0	49	36	0	50	32	0	51	27	6
8	0	42	11	0	43	7	0	44	8	0	45	5	0	46	3	0	47	0	0	47	55	0	48	50	0	49	45	0	50	40	8
10	0	41	24	0	42	20	0	43	17	0	44	13	0	45	10	0	46	6	0	47	0	0	47	54	0	48	48	0	49	41	10
12	0	40	25	0	41	21	0	42	16	0	43	11	0	44	5	0	45	0	0	45	53	0	46	46	0	47	39	0	48	31	12
14	0	39	15	0	40	8	0	41	2	0	41	55	0	42	49	0	43	42	0	44	33	0	45	25	0	46	16	0	47	6	14
16	0	37	55	0	38	46	0	39	38	0	40	30	0	41	21	0	42	13	0	43	3	0	43	53	0	44	43	0	45	32	16
18	0	36	24	0	37	14	0	38	4	0	38	53	0	39	42	0	40	31	0	41	19	0	42	8	0	42	56	0	43	43	18
20	0	34	44	0	35	32	0	36	19	0	37	6	0	37	53	0	38	40	0	39	26	0	40	12	0	40	58	0	41	43	20
22	0	32	55	0	33	39	0	34	24	0	35	9	0	35	54	0	36	39	0	37	23	0	38	6	0	38	50	0	39	34	22
24	0	31	0	0	31	42	0	32	24	0	33	6	0	33	49	0	34	31	0	35	12	0	35	53	0	36	34	0	37	16	24
26	0	28	47	0	29	26	0	30	4	0	30	44	0	31	23	0	32	3	0	32	42	0	33	20	0	33	59	0	34	38	26
28	0	26	32	0	27	7	0	27	43	0	28	19	0	29	56	0	29	32	0	30	8	0	30	43	0	31	19	0	31	55	28
30	0	24	7	0	24	39	0	25	11	0	25	44	0	26	18	0	26	51	0	27	24	0	27	56	0	28	29	0	29	2	30
32	0	21	32	0	22	3	0	22	33	0	23	3	0	23	32	0	24	2	0	24	31	0	25	1	0	25	30	0	25	59	32
34	0	18	54	0	19	22	0	19	49	0	20	15	0	20	41	0	21	7	0	21	33	0	21	59	0	22	25	0	22	50	34
36	0	16	6	0	16	30	0	16	54	0	17	17	0	17	39	0	18	2	0	18	24	0	18	47	0	19	9	0	19	31	36
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	38

42	0 7 11	0 7 24	0 7 36	0 7 40	0 7 50	0 8 0	0 8 18	0 8 30	0 8 42	0 8 54	42
44	0 4 4	0 4 12	0 4 20	0 4 26	0 4 32	0 4 38	0 4 46	0 4 54	0 5 2	0 5 10	44
46	0 0 54	0 0 58	0 1 2	0 1 4	0 1 6	0 1 8	0 1 12	0 1 15	0 1 19	0 1 13	46
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
48	0 2 22	0 2 23	0 2 24	0 2 25	0 2 25	0 2 26	0 2 26	0 2 27	0 2 27	0 2 27	48
50	0 5 35	0 5 41	0 5 46	0 5 51	0 5 57	0 6 2	0 6 6	0 6 11	0 6 15	0 6 19	50
52	0 8 53	0 9 2	0 9 12	0 9 21	0 9 31	0 9 40	0 9 48	0 9 56	0 10 4	0 10 11	52
54	0 12 8	0 12 22	0 12 36	0 12 50	0 13 4	0 13 18	0 13 30	0 13 41	0 13 53	0 14 4	54
56	0 15 22	0 15 41	0 15 59	0 16 17	0 16 34	0 16 52	0 17 8	0 17 24	0 17 40	0 17 55	56
58	0 18 35	0 18 58	0 19 21	0 19 42	0 20 4	0 20 25	0 20 45	0 21 4	0 21 24	0 21 43	58
60	0 21 44	0 22 10	0 22 37	0 23 3	0 23 29	0 23 55	0 24 19	0 24 43	0 25 7	0 25 30	60
62	0 24 47	0 25 18	0 25 49	0 26 19	0 26 49	0 27 19	0 28 47	0 29 14	0 28 42	0 29 8	62
64	0 27 48	0 28 24	0 28 58	0 29 31	0 30 5	0 30 38	0 31 9	0 31 41	0 32 12	0 32 42	64
66	0 30 40	0 31 18	0 31 57	0 32 34	0 33 11	0 33 48	0 34 22	0 34 57	0 35 31	0 36 5	66
68	0 33 25	0 34 7	0 34 50	0 35 31	0 36 11	0 36 52	0 37 30	0 38 8	0 38 46	0 39 22	68
70	0 36 1	0 36 46	0 37 32	0 38 16	0 39 1	0 39 45	0 40 26	0 41 7	0 41 48	0 42 27	70
72	0 38 25	0 39 15	0 40 4	0 40 51	0 41 38	0 42 25	0 43 8	0 43 51	0 44 35	0 45 18	72
74	0 40 39	0 41 31	0 42 24	0 43 14	0 44 4	0 44 54	0 45 41	0 46 27	0 47 14	0 47 59	74
76	0 42 40	0 43 35	0 44 30	0 45 22	0 46 15	0 47 7	0 47 57	0 48 46	0 49 36	0 50 22	76
78	0 44 27	0 45 24	0 46 22	0 47 16	0 48 11	0 49 5	0 49 57	0 50 49	0 51 41	0 52 30	78
80	0 45 59	0 46 59	0 47 59	0 48 55	0 49 52	0 50 48	0 51 41	0 52 34	0 53 28	0 54 19	80
82	0 47 15	0 48 16	0 49 18	0 50 17	0 51 15	0 52 14	0 53 8	0 54 3	0 54 57	0 55 49	82
84	0 48 16	0 49 18	0 50 21	0 51 22	0 52 22	0 53 23	0 54 19	0 55 14	0 56 10	0 57 4	84
86	0 49 1	0 50 5	0 51 9	0 52 10	0 53 11	0 54 12	0 55 9	0 56 5	0 57 2	0 57 56	86
88	0 49 26	0 50 32	0 51 37	0 52 37	0 53 37	0 54 38	0 55 36	0 56 33	0 57 31	0 58 25	88
90	0 49 37	0 50 41	0 51 45	0 52 46	0 53 47	0 54 48	0 55 46	0 56 44	0 57 42	0 58 37	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

MEAN ANOMALY I Sign,

Apogé ☽ 1° Ti. equat. à ☉	20°			21°			22°			23°			24°			25°			26°			27°			28°			29°			Apogé ☽ 1° Ti. equat. à ☉
	A.			A.			A.			A.			A.			A.			A.			A.			A.			A.			
°	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°
0	0	53	23	0	54	19	0	55	13	0	56	6	0	57	0	0	57	52	0	58	44	0	59	36	1	0	25	1	1	14	0
2	0	53	12	0	54	8	0	55	1	0	55	55	0	56	48	0	57	40	0	58	32	0	59	24	1	0	13	1	1	1	2
4	0	52	54	0	53	49	0	54	42	0	55	36	0	56	29	0	57	20	0	58	12	0	59	3	0	59	52	1	0	40	4
6	0	52	23	0	53	18	0	54	10	0	55	3	0	55	55	0	56	46	0	57	37	0	58	28	0	59	16	1	0	5	6
8	0	51	34	0	52	29	0	53	21	0	54	12	0	55	4	0	55	54	0	56	45	0	57	35	0	58	23	0	59	10	8
10	0	50	35	0	51	28	0	52	20	0	53	11	0	54	3	0	54	51	0	55	39	0	56	27	0	57	14	0	58	1	10
12	0	49	24	0	50	16	0	51	6	0	51	57	0	52	47	0	53	35	0	54	22	0	55	10	0	55	56	0	56	41	12
14	0	47	56	0	48	48	0	49	37	0	50	26	0	51	15	0	52	2	0	52	48	0	53	35	0	54	19	0	55	4	14
16	0	46	21	0	47	11	0	47	58	0	48	44	0	49	31	0	50	16	0	51	2	0	51	47	0	52	31	0	53	14	16
18	0	44	30	0	45	18	0	46	3	0	46	48	0	47	33	0	48	17	0	49	2	0	49	46	0	50	27	0	51	7	18
20	0	42	29	0	43	14	0	43	57	0	44	40	0	45	23	0	46	6	0	46	48	0	47	30	0	48	10	0	48	49	20
22	0	40	17	0	41	1	0	41	41	0	42	22	0	43	2	0	43	42	0	44	23	0	45	3	0	45	40	0	46	18	22
24	0	37	57	0	38	39	0	39	17	0	39	55	0	40	33	0	41	11	0	41	49	0	42	27	0	43	3	0	44	39	24
26	0	35	16	0	35	55	0	36	31	0	37	7	0	37	43	0	38	18	0	38	54	0	39	29	0	40	3	0	40	36	26
28	0	32	31	0	33	7	0	33	40	0	34	12	0	34	45	0	35	18	0	35	52	0	36	25	0	36	57	0	37	28	28
30	0	29	35	0	30	8	0	30	38	0	31	9	0	31	39	0	32	9	0	32	40	0	33	10	0	33	39	0	34	8	30
32	0	26	27	0	26	56	0	27	25	0	27	53	0	28	22	0	28	50	0	29	17	0	29	45	0	30	12	0	30	38	32
34	0	23	16	0	23	41	0	24	7	0	24	33	0	24	59	0	25	23	0	25	48	0	26	12	0	26	36	0	26	59	34
36	0	19	53	0	20	15	0	20	37	0	21	0	0	21	22	0	21	43	0	22	5	0	22	26	0	22	47	0	23	7	36
38	0	16	23	0	16	42	0	17	1	0	17	[illegible]	0	17	[illegible]	[illegible]	[illegible]	[illegible]	0	18	15	0	18	34	0	18	50	0	19	8	38

42	0 9 5	0 9 17	0 9 29	0 9 40	0 9 52	0 10 4	0 10 15	0 10 27	0 10 37	0 10 47	42
44	0 5 18	0 5 26	0 5 34	0 5 42	0 5 50	0 5 58	0 6 7	0 6 15	0 6 22	0 6 29	44
46	0 1 18	0 1 32	0 1 37	0 1 41	0 1 46	0 1 50	0 1 54	0 1 58	0 2 1	0 2 5	46
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
48	0 2 28	0 2 26	0 2 26	0 2 25	0 2 24	0 2 23	0 2 23	0 2 22	0 2 19	0 2 16	48
50	0 6 22	0 6 26	0 6 29	0 6 31	0 6 34	0 6 37	0 6 39	0 6 42	0 6 43	0 6 43	50
52	0 10 19	0 10 26	0 10 33	0 10 39	0 10 46	0 10 52	0 10 59	0 11 5	0 11 9	0 11 14	52
54	0 14 15	0 14 26	0 14 37	0 14 47	0 14 58	0 15 8	0 15 17	0 15 27	0 15 35	0 15 43	54
56	0 18 11	0 18 26	0 18 40	0 18 55	0 19 9	0 19 22	0 19 36	0 19 49	0 20 0	0 20 10	56
58	0 22 2	0 22 21	0 22 39	0 22 58	0 23 14	0 23 31	0 23 48	0 24 5	0 24 20	0 24 34	58
60	0 25 52	0 26 15	0 26 36	0 26 57	0 27 18	0 27 38	0 27 59	0 28 19	0 28 37	0 28 54	60
62	0 29 34	0 30 0	0 30 25	0 30 49	0 31 14	0 31 37	0 32 1	0 32 24	0 32 45	0 33 7	62
64	0 33 11	0 33 41	0 34 9	0 34 37	0 35 5	0 35 32	0 35 58	0 36 25	0 36 49	0 37 14	64
66	0 36 38	0 37 12	0 37 44	0 38 16	0 38 48	0 39 17	0 39 47	0 40 16	0 40 43	0 41 9	66
68	0 39 58	0 40 34	0 41 9	0 41 44	0 42 19	0 42 52	0 43 24	0 43 57	0 44 26	0 44 56	68
70	0 43 7	0 43 46	0 44 23	0 45 0	0 45 37	0 46 13	0 46 50	0 47 26	0 47 58	0 48 30	70
72	0 46 2	0 46 45	0 47 25	0 48 6	0 48 46	0 49 24	0 50 3	0 50 41	0 51 15	0 51 49	72
74	0 48 43	0 49 28	0 50 11	0 50 54	0 51 38	0 52 18	0 52 58	0 53 38	0 54 15	0 54 51	74
76	0 51 8	0 51 54	0 52 39	0 53 25	0 54 10	0 54 53	0 55 37	0 56 20	0 56 58	0 57 37	76
78	0 53 19	0 54 8	0 54 55	0 55 43	0 56 30	0 57 15	0 57 59	0 58 44	0 59 24	1 0 3	78
80	0 55 11	0 56 2	0 56 51	0 57 40	0 58 29	0 59 15	1 0 1	1 0 47	1 1 28	1 2 10	80
82	0 56 42	0 57 31	0 58 24	0 59 15	1 0 5	1 0 53	1 1 40	1 2 28	1 3 12	1 3 55	82
84	0 57 57	0 58 50	0 59 42	1 0 34	1 1 26	1 2 15	1 3 4	1 3 53	1 4 36	1 5 20	84
86	0 58 50	0 59 44	1 0 37	1 1 29	1 2 22	1 3 11	1 4 1	1 4 50	1 5 34	1 6 19	86
88	0 59 20	1 0 14	1 1 7	1 2 1	1 2 54	1 3 44	1 4 34	1 5 24	1 6 9	1 6 53	88
90	0 59 32	1 0 27	1 1 23	1 2 20	1 3 6	1 3 56	1 4 46	1 5 36	1 6 21	1 7 7	90

Reduction of the Mean to the true Elliptic Equation ☽.

Mean Anomaly 2 Signs.

Apoge ☽ 1s Ti. equat. à ☉	0°			1°			2°			3°			4°			5°			6°			7°			8°			9°			Apoge ☽ 1° Ti. equat. à ☉
	A.			A.			A.			A.			A.			A.			A.			A.			A.			A:			
°	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°
0	1	2	3	1	2	52	1	3	42	1	4	31	1	5	17	1	6	2	1	6	48	1	7	31	1	8	13	1	8	56	0
2	1	1	50	1	2	39	1	3	28	1	4	17	1	5	3	1	5	49	1	6	35	1	7	18	1	8	0	1	8	43	2
4	1	1	29	1	2	18	1	3	7	1	3	56	1	4	41	1	5	25	1	6	10	1	6	53	1	7	36	1	8	19	4
6	1	0	53	1	1	41	1	2	30	1	3	18	1	4	2	1	4	47	1	5	31	1	6	14	1	6	56	1	7	39	6
8	0	59	58	1	0	45	1	1	33	1	2	20	1	3	4	1	3	49	1	4	33	1	5	15	1	5	56	1	6	38	8
10	0	58	48	0	59	35	1	0	21	1	1	8	1	1	52	1	2	37	1	3	21	1	4	1	1	4	42	1	5	22	10
12	0	57	27	0	58	13	0	58	58	0	59	44	1	0	27	1	1	9	1	1	52	1	2	32	1	3	12	1	3	52	12
14	0	55	48	0	56	32	0	57	17	0	58	1	0	58	43	0	59	25	1	0	7	1	0	46	1	1	24	1	2	3	14
16	0	53	58	0	54	40	0	55	22	0	56	4	0	56	44	0	57	23	0	58	3	0	58	41	0	59	20	0	59	58	16
18	0	51	48	0	52	30	0	53	11	0	53	53	0	54	32	0	55	10	0	55	48	0	56	25	0	57	1	0	57	38	18
20	0	49	29	0	50	8	0	50	48	0	51	27	0	52	4	0	52	42	0	53	19	0	53	54	0	54	29	0	55	4	20
22	0	46	55	0	47	33	0	48	11	0	48	49	0	49	24	0	50	0	0	50	35	0	51	9	0	51	42	0	52	16	22
24	0	44	15	0	44	50	0	45	26	0	46	1	0	46	35	0	47	9	0	47	43	0	48	15	0	48	46	0	49	18	24
26	0	41	10	0	41	43	0	42	17	0	42	50	0	43	21	0	43	53	0	44	24	0	44	54	0	45	24	0	45	54	26
28	0	37	59	0	38	30	0	39	1	0	39	32	0	40	1	0	40	31	0	41	0	0	41	28	0	41	56	0	42	24	28
30	0	34	37	0	35	5	0	35	34	0	36	2	0	36	29	0	36	56	0	37	23	0	37	49	0	38	15	0	38	41	30
32	0	31	5	0	31	31	0	31	56	0	32	22	0	32	46	0	33	11	0	33	35	0	33	59	0	34	22	0	34	46	32
34	0	27	23	0	27	47	0	28	10	0	28	33	0	28	55	0	29	16	0	29	38	0	30	0	0	30	22	0	30	44	34
36	0	23	28	0	23	40	0	24	0	0	24	30	0	24	[illegible]	0	25	0	0	25	28	0	25	47	0	26	7	0	26	26	36

42	0 10 57	0 11 11	0 11 24	0 11 38	0 11 49	0 12 0	0 12 11	0 12 22	0 12 33	0 12 44	42
44	0 6 36	0 6 47	0 6 57	0 7 8	0 7 16	0 7 24	0 7 32	0 7 41	0 7 49	0 7 58	44
46	0 2 8	0 2 16	0 2 25	0 2 33	0 2 38	0 2 43	0 2 48	0 2 54	0 3 0	0 3 6	46
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
48	0 2 13	0 2 14	0 2 15	0 2 6	0 2 4	0 2 2	0 2 0	0 1 57	0 1 53	0 1 50	48
50	0 6 44	0 6 46	0 6 48	0 6 50	0 6 50	0 6 49	0 6 49	0 6 49	0 6 48	0 6 48	50
52	0 11 18	0 11 22	0 11 26	0 11 30	0 11 33	0 11 37	0 11 40	0 11 42	0 11 45	0 11 47	52
54	0 15 51	0 15 58	0 16 5	0 16 12	0 16 19	0 16 25	0 16 32	0 16 37	0 16 42	0 16 47	54
56	0 20 21	0 20 31	0 20 42	0 20 52	0 21 1	0 21 11	0 21 20	0 21 28	0 21 35	0 21 43	56
58	0 24 49	0 25 3	0 25 16	0 25 28	0 25 40	0 25 52	0 26 4	0 26 15	0 26 25	0 26 36	58
60	0 29 12	0 29 28	0 29 44	0 30 0	0 30 15	0 30 30	0 30 45	0 30 58	0 31 11	0 31 24	60
62	0 33 28	0 33 47	0 34 7	0 34 26	0 34 43	0 35 1	0 35 18	0 35 34	0 35 50	0 36 6	62
64	0 37 38	0 38 0	0 38 22	0 38 44	0 39 4	0 39 24	0 39 44	0 40 3	0 40 22	0 40 41	64
66	0 41 36	0 42 1	0 42 27	0 42 52	0 43 15	0 43 37	0 44 0	0 44 21	0 44 41	0 45 2	66
68	0 45 25	0 45 53	0 46 20	0 46 48	0 47 13	0 47 38	0 48 3	0 48 26	0 48 49	0 49 12	68
70	0 49 2	0 49 32	0 50 2	0 50 32	0 50 59	0 51 27	0 51 54	0 52 19	0 52 44	0 53 9	70
72	0 52 23	0 52 55	0 53 28	0 54 0	0 54 30	0 54 59	0 55 29	0 55 55	0 56 22	0 56 48	72
74	0 55 28	0 56 3	0 56 37	0 57 12	0 57 42	0 58 15	0 58 46	0 59 15	0 59 43	1 0 12	74
76	0 58 15	0 58 52	0 59 28	1 0 5	1 0 38	1 1 11	1 1 44	1 2 14	1 2 45	1 3 15	76
78	1 0 43	1 1 22	1 2 0	1 2 39	1 3 14	1 3 48	1 4 23	1 4 54	1 5 26	1 5 57	78
80	1 2 51	1 3 31	1 4 12	1 4 52	1 5 28	1 6 4	1 6 40	1 7 12	1 7 45	1 8 17	80
82	1 4 39	1 5 20	1 6 0	1 6 41	1 7 18	1 7 56	1 8 33	1 9 7	1 9 40	1 10 14	82
84	1 6 3	1 6 45	1 7 27	1 8 9	1 8 47	1 9 26	1 10 4	1 10 38	1 11 12	1 11 46	84
86	1 7 3	1 7 46	1 8 28	1 9 11	1 9 50	1 10 29	1 11 8	1 11 43	1 12 18	1 12 53	86
88	1 7 38	1 8 21	1 9 3	1 9 46	1 10 25	1 11 5	1 11 44	1 12 19	1 12 55	1 13 30	88
90	1 7 52	1 8 35	1 9 18	1 10 1	1 10 41	1 11 20	1 12 0	1 12 35	1 13 11	1 13 46	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

MEAN ANOMALY 2 Signs.

Apoge ☽ 1° Ti. equat. à ☉.	10°			11°			12°			13°			14°			15°			16°			17°			18°			19°			Apoge ☽ 1° Ti. equat. à ☉.
		A.			A.			A.			A.			A.			A.			A.			A.			A.			A.		
°	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°
0	1	9	36	1	10	16	1	10	56	1	11	33	1	12	11	1	12	48	1	13	23	1	13	57	1	14	32	1	15	3	0
2	1	9	23	1	10	2	1	10	42	1	11	19	1	11	57	1	12	34	1	13	9	1	13	43	1	14	18	1	14	51	2
4	1	8	59	1	9	39	1	10	19	1	10	56	1	11	32	1	12	9	1	12	44	1	13	18	1	13	53	1	14	23	4
6	1	8	18	1	8	58	1	9	37	1	10	14	1	10	50	1	11	27	1	12	2	1	12	36	1	13	11	1	13	41	6
8	1	7	17	1	7	55	1	8	34	1	9	10	1	9	47	1	10	23	1	10	57	1	11	30	1	12	4	1	12	34	8
10	1	6	0	1	6	38	1	7	16	1	7	52	1	8	27	1	9	3	1	9	36	1	10	10	1	10	43	1	11	13	10
12	1	3	29	1	4	7	1	5	44	1	6	19	1	6	53	1	7	28	1	8	1	1	8	33	1	9	6	1	9	35	12
14	1	2	40	1	3	16	1	3	53	1	4	27	1	5	0	1	5	34	1	6	6	1	6	37	1	7	9	1	7	37	14
16	1	0	33	1	1	8	1	1	43	1	2	16	1	2	48	1	3	21	1	3	52	1	4	24	1	4	55	1	5	22	16
18	0	58	11	0	58	45	0	59	18	0	59	51	1	0	24	1	0	57	1	1	27	1	1	56	1	2	26	1	2	53	18
20	0	55	38	0	56	13	0	56	47	0	57	16	0	57	46	0	58	15	0	58	44	0	59	12	0	59	41	1	0	6	20
22	0	52	47	0	53	19	0	53	50	0	54	20	0	54	49	0	55	19	0	55	46	0	56	13	0	56	40	0	57	5	22
24	0	49	48	0	50	17	0	50	47	0	51	16	0	51	44	0	52	13	0	52	39	0	53	4	0	53	30	0	53	53	24
26	0	46	22	0	46	50	0	47	18	0	47	45	0	48	11	0	48	38	0	49	02	0	49	27	0	49	51	0	50	13	26
28	0	42	50	0	43	16	0	43	42	0	44	7	0	44	33	0	44	58	0	45	20	0	45	43	0	46	5	0	46	26	28
30	0	39	5	0	39	28	0	39	52	0	40	16	0	40	39	0	41	3	0	41	24	0	41	45	0	42	6	0	42	26	30
32	0	35	9	0	35	31	0	35	54	0	36	15	0	36	35	0	36	56	0	37	16	0	37	36	0	37	56	0	38	15	32
34	0	31	5	0	31	46	0	31	45	0	[illegible]	1	0	[illegible]	[illegible]	0	[illegible]	41	0	[illegible]	50	0	33	18	0	33	36	0	33	53	34

42	0 12 56	0 13 7	0 13 19	0 13 30	0 13 40	0 13 51	0 14 2	0 14 13	0 14 24	0 14 33	42
44	0 8 07	0 8 16	0 8 25	0 8 33	0 8 42	0 8 50	0 8 59	0 9 7	0 9 16	0 9 24	44
46	0 3 13	0 3 19	0 3 26	0 3 22	0 3 38	0 3 44	0 3 51	0 3 58	0 4 5	0 4 11	46
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
48	0 1 46	0 1 42	0 1 38	0 1 34	0 1 31	0 1 27	0 1 23	0 1 18	0 1 14	0 1 9	48
50	0 6 47	0 6 45	0 6 44	0 6 42	0 6 41	0 6 39	0 6 36	0 6 34	0 6 31	0 6 29	50
52	0 11 48	0 11 49	0 11 48	0 11 50	0 11 52	0 11 54	0 11 54	0 11 53	0 11 53	0 11 52	52
54	0 11 50	0 11 54	0 16 57	0 17 1	0 17 4	0 17 8	0 17 9	0 17 10	0 17 11	0 17 12	54
56	0 21 49	0 21 54	0 22 0	0 22 6	0 22 13	0 22 19	0 22 22	0 22 25	0 22 28	0 22 30	56
58	0 26 44	0 26 52	0 27 0	0 27 9	0 27 17	0 27 26	0 27 31	0 27 35	0 27 40	0 27 44	58
60	0 31 34	0 31 45	0 31 55	0 32 6	0 32 18	0 32 29	0 32 36	0 32 42	0 32 49	0 32 54	60
62	0 36 19	0 36 31	0 36 44	0 36 57	0 37 11	0 37 24	0 37 32	0 37 40	0 37 48	0 37 55	62
64	0 40 55	0 41 9	0 41 23	0 41 39	0 41 54	0 42 10	0 42 19	0 42 29	0 42 38	0 42 47	64
66	0 45 19	0 45 35	0 45 52	0 46 9	0 46 27	0 46 44	0 46 56	0 47 7	0 47 19	0 47 29	66
68	0 49 31	0 49 50	0 50 9	0 50 28	0 50 47	0 51 6	0 51 20	0 51 33	0 51 47	0 51 58	68
70	0 53 30	0 53 50	0 54 11	0 54 32	0 54 53	0 55 14	0 55 29	0 55 43	0 55 58	0 56 11	70
72	0 57 11	0 57 34	0 57 57	0 58 20	0 58 42	0 59 5	0 59 21	0 59 37	0 59 53	1 0 7	72
74	1 0 36	1 1 1	1 1 25	1 1 49	1 2 13	1 2 37	1 2 55	1 3 12	1 3 30	1 3 45	74
76	1 3 41	1 4 7	1 4 33	1 4 58	1 5 23	1 5 48	1 6 7	1 6 26	1 6 45	1 7 1	76
78	1 6 24	1 6 52	1 7 19	1 7 45	1 7 12	1 8 38	1 8 58	1 9 18	1 9 38	1 9 54	78
80	1 8 45	1 9 14	1 9 42	1 10 9	1 10 36	1 11 3	1 11 25	1 11 46	1 12 8	1 12 24	80
82	1 10 43	1 11 12	1 11 41	1 12 10	1 12 38	1 13 7	1 13 28	1 13 50	1 14 11	1 14 29	82
84	1 12 16	1 12 47	1 13 17	1 13 46	1 14 15	1 14 44	1 15 5	1 15 25	1 15 46	1 16 6	84
86	1 13 23	1 13 54	1 14 24	1 14 53	1 15 23	1 15 52	1 16 15	1 16 38	1 17 1	1 17 20	86
88	1 14 1	1 14 32	1 15 3	1 15 33	1 16 2	1 16 32	1 16 55	1 17 18	1 17 41	1 18 0	88
90	1 14 17	1 14 49	1 15 20	1 15 50	1 16 19	1 16 49	1 17 12	1 17 35	1 17 58	1 18 17	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

MEAN ANOMALY 2 Signs.

Apoge ☽ 1° 11. equat. à ☉	20°			21°			22°			23°			24°			25°			26°			27°			28°			29°			Apoge ☽ 1° 11. equat. à ☉
	A.			A.			A.			A.			A.			A.			A.			A.			A.			A.			
°	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°
0	1	15	34	1	16	5	1	16	32	1	17	0	1	17	27	1	17	51	1	18	16	1	18	40	1	19	0	1	19	20	0
2	1	15	20	1	15	50	1	16	17	1	16	45	1	17	12	1	17	37	1	18	1	1	18	25	1	18	45	1	19	4	2
4	1	14	54	1	15	24	1	15	51	1	16	18	1	16	45	1	17	9	1	17	34	1	17	58	1	18	18	1	18	37	4
6	1	14	11	1	14	41	1	15	8	1	15	35	1	16	2	1	16	26	1	16	50	1	17	14	1	17	33	1	17	53	6
8	1	13	5	1	13	35	1	14	1	1	14	27	1	14	53	1	15	17	1	15	41	1	16	5	1	16	24	1	16	44	8
10	1	11	42	1	12	12	1	12	38	1	13	5	1	13	31	1	13	54	1	14	17	1	14	40	1	14	59	1	15	18	10
12	1	10	3	1	10	32	1	10	57	1	11	23	1	11	48	1	12	12	1	12	36	1	13	0	1	13	18	1	13	37	12
14	1	8	6	1	8	34	1	8	59	1	9	24	1	9	49	1	10	11	1	10	34	1	10	57	1	11	15	1	11	33	14
16	1	5	50	1	6	17	1	6	42	1	7	6	1	7	31	1	7	52	1	8	13	1	8	34	1	8	53	1	9	11	16
18	1	3	19	1	3	46	1	4	9	1	4	33	1	4	56	1	5	17	1	5	39	1	6	0	1	6	18	1	6	35	18
20	1	0	32	1	0	57	1	1	20	1	1	42	1	2	5	1	2	26	1	2	46	1	3	7	1	3	24	1	3	40	20
22	0	57	29	0	57	54	0	58	15	0	58	37	0	58	58	0	59	18	0	59	38	0	59	58	1	0	14	1	0	31	22
24	0	54	17	0	54	40	0	55	0	0	55	21	0	55	41	0	56	0	0	56	19	0	56	38	0	56	54	0	57	9	24
26	0	50	35	0	50	57	0	51	16	0	51	35	0	51	54	0	52	13	0	52	31	0	52	50	0	53	5	0	53	19	26
28	0	46	47	0	47	8	0	47	26	0	47	44	0	48	2	0	48	19	0	48	37	0	48	54	0	49	8	0	49	22	28
30	0	42	45	0	43	5	0	43	22	0	43	38	0	43	55	0	44	11	0	44	28	0	44	44	0	44	57	0	45	11	30
32	0	38	33	0	38	51	0	39	7	0	39	22	0	39	38	0	39	53	0	40	7	0	40	22	0	40	35	0	40	47	32
34	0	34	10	0	34	27	0	34	41	0	34	56	0	35	10	0	35	24	0	35	30	0	35	53	0	36	4	0	36	16	34

42	0 14 43	0 14 52	0 15 1	0 15 10	0 15 19	0 15 28	0 15 38	0 15 47	0 15 50	0 10 4	42
44	0 9 32	0 9 40	0 9 48	0 9 55	0 10 3	0 10 11	0 10 18	0 10 26	0 10 34	0 10 43	44
46	0 4 17	0 4 23	0 4 29	0 4 35	0 4 41	0 4 48	0 4 54	0 5 1	0 5 9	0 5 16	46
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
48	0 1 5	0 1 0	0 0 55	0 0 51	0 0 46	0 0 41	0 0 35	0 0 30	0 0 16	0 0 2	48
50	0 6 26	0 6 24	0 6 21	0 6 17	0 6 14	0 6 10	0 6 5	0 6 1	0 5 56	0 5 51	50
52	0 11 50	0 11 49	0 11 47	0 11 46	0 11 44	0 11 41	0 11 39	0 11 36	0 11 32	0 11 28	52
54	0 17 12	0 17 13	0 17 13	0 17 13	0 17 13	0 17 11	0 17 8	0 17 6	0 17 4	0 17 1	54
56	0 22 33	0 22 35	0 22 36	0 22 38	0 22 39	0 22 38	0 22 37	0 22 36	0 22 34	0 22 33	56
58	0 27 48	0 27 52	0 27 55	0 27 57	0 28 0	0 28 0	0 28 0	0 28 1	0 28 1	0 28 0	58
60	0 33 0	0 33 5	0 33 9	0 33 14	0 33 18	0 33 19	0 33 20	0 33 21	0 33 22	0 33 23	60
62	0 38 2	0 38 9	0 38 15	0 38 20	0 38 26	0 38 29	0 38 32	0 38 35	0 38 36	0 38 37	62
64	0 42 55	0 43 4	0 43 12	0 43 19	0 43 27	0 43 31	0 43 34	0 43 38	0 43 39	0 43 41	64
66	0 47 39	0 47 49	0 47 57	0 48 6	0 48 14	0 48 19	0 48 23	0 48 28	0 48 31	0 48 33	66
63	0 52 9	0 52 20	0 52 30	0 52 39	0 52 49	0 52 54	0 52 59	0 53 4	0 53 8	0 53 11	68
70	0 56 23	0 56 36	0 56 46	0 56 57	0 57 7	0 57 14	0 57 21	0 57 28	0 57 32	0 57 36	70
72	1 0 21	1 0 35	1 0 46	1 0 58	1 1 9	1 1 17	1 1 24	1 1 32	1 1 36	1 1 41	72
74	1 3 59	1 4 14	1 4 26	1 4 39	1 4 51	1 4 59	1 5 8	1 5 16	1 5 21	1 1 27	74
76	1 7 16	1 7 32	1 7 45	1 7 59	1 8 12	1 8 21	1 8 30	1 8 39	1 8 45	1 8 51	76
78	1 10 11	1 10 27	1 10 41	1 10 56	1 11 10	1 11 20	1 11 29	1 11 39	1 11 45	1 11 51	78
80	1 12 41	1 12 57	1 13 12	1 13 28	1 13 43	1 13 53	1 14 4	1 14 14	1 14 20	1 14 27	80
82	1 14 47	1 15 5	1 15 20	1 15 35	1 15 50	1 16 1	1 16 11	1 16 22	1 16 29	1 16 36	82
84	1 16 25	1 16 45	1 17 0	1 17 16	1 17 32	1 17 43	1 17 55	1 18 6	1 18 13	1 18 20	84
86	1 17 38	1 17 57	1 18 13	1 18 29	1 18 45	1 18 56	1 19 8	1 19 19	1 19 26	1 19 33	86
88	1 18 20	1 18 39	1 18 55	1 19 11	1 19 27	1 19 38	1 19 50	1 20 1	1 20 8	1 20 15	88
90	1 18 35	1 18 54	1 19 10	1 19 27	1 19 43	1 19 54	1 20 6	1 20 17	1 20 24	1 20 31	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

MEAN ANOMALY 3 Signs.

Apoge ☽ 1° Ti. equat. à ☉	0°			1°			2°			3°			4°			5°			6°			7°			8°			9°			Apoge ☽ 1° Ti. equat. à ☉
	A.			A.			A.			A.			A.			A.			A.			A.			A.			A.			
°	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°
0	1	19	40	1	19	56	1	20	12	1	20	28	1	20	40	1	20	51	1	21	3	1	21	11	1	21	18	1	21	26	0
2	1	19	24	1	19	40	1	19	57	1	20	13	1	20	25	1	20	36	1	20	48	1	20	56	1	21	4	1	21	12	2
4	1	18	57	1	19	13	1	19	30	1	19	46	1	19	57	1	19	9	1	20	20	1	20	28	1	20	36	1	20	44	4
6	1	18	12	1	18	28	1	18	44	1	19	0	1	19	12	1	19	23	1	19	35	1	19	43	1	19	50	1	19	58	6
8	1	17	3	1	17	19	1	17	34	1	17	50	1	18	1	1	18	12	1	18	24	1	18	32	1	18	40	1	18	48	8
10	1	15	37	1	15	53	1	16	8	1	16	24	1	16	35	1	16	45	1	16	56	1	17	3	1	17	11	1	17	19	10
12	1	13	55	1	14	11	1	14	26	1	14	42	1	14	52	1	15	2	1	15	12	1	15	20	1	15	27	1	15	35	12
14	1	11	51	1	12	6	1	12	21	1	12	36	1	12	46	1	12	57	1	13	7	1	13	15	1	13	23	1	13	31	14
16	1	9	30	1	9	46	1	10	2	1	10	18	1	10	27	1	10	35	1	10	44	1	10	52	1	10	59	1	11	7	16
18	1	6	53	1	7	7	1	7	22	1	7	36	1	7	45	1	7	55	1	8	4	1	8	12	1	8	19	1	8	27	18
20	1	3	57	1	4	11	1	4	25	1	4	39	1	4	48	1	4	58	1	5	7	1	5	14	1	5	22	1	5	29	20
22	1	0	47	1	1	0	1	1	13	1	1	26	1	1	35	1	1	45	1	1	54	1	2	1	1	2	8	1	2	15	22
24	0	57	25	0	57	38	0	57	51	0	58	4	0	58	13	0	58	21	0	58	30	0	58	36	0	58	43	0	58	49	24
26	0	53	34	0	53	46	0	53	59	0	54	11	0	54	17	0	54	22	0	54	28	0	54	38	0	54	47	0	54	57	26
28	0	49	36	0	49	48	0	49	59	0	50	11	0	50	16	0	50	22	0	50	27	0	50	35	0	50	44	0	50	52	28
30	0	45	24	0	45	35	0	45	46	0	45	57	0	46	2	0	46	7	0	46	12	0	46	22	0	46	31	0	46	41	30
32	0	41	0	0	41	11	0	41	21	0	41	32	0	41	40	0	41	47	0	41	55	0	42	1	0	42	8	0	42	14	32
34	0	36	27	0	36	37	0	36	46	0	36	56	0	37	3	0	37	10	0	37	17	0	37	24	0	37	30	0	37	37	34
36	0	31	36	0	31	45	0	31	55	0	32	4	0	32	11	0	32	18	0	32	25	0	32	31	0	32	37	0	32	43	36
38	0	26	35	0	26	44	0	26	53	0	27	2	0	27	9	0	27	15	0	27	22	0	27	28	0	27	35	0	27	41	38

42	0 16 13	0 16 20	0 16 28	0 16 35	0 16 40	0 16 46	0 16 51	0 16 57	0 17 3	0 17 10	42
44	0 10 51	0 10 58	0 11 5	0 11 12	0 11 17	0 11 21	0 11 26	0 11 32	0 11 38	0 11 44	44
46	0 5 24	0 5 29	0 5 35	0 5 40	0 5 48	0 5 57	0 6 5	0 6 7	0 6 10	0 6 12	46
48				0 0 4	0 0 9	0 0 15	0 0 20	0 0 26	0 0 31	0 0 37	48
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
48	0 0 12	0 0 7	0 0 1								
50	0 5 46	0 5 42	0 5 38	0 5 34	0 5 29	0 5 23	0 5 18	0 5 12	0 5 6	0 5 0	50
52	0 11 24	0 11 20	0 11 16	0 11 12	0 11 7	0 11 3	0 10 58	0 10 52	0 10 45	0 10 39	52
54	0 16 59	0 16 56	0 16 52	0 16 49	0 16 45	0 16 40	0 16 36	0 16 30	0 16 25	0 16 19	54
56	0 22 31	0 22 29	0 22 26	0 22 24	0 22 20	0 22 15	0 22 11	0 22 5	0 21 59	0 21 53	56
58	0 28 0	0 27 59	0 27 57	0 27 56	0 27 51	0 27 46	0 27 41	0 27 36	0 27 30	0 27 25	58
60	0 33 23	0 33 22	0 33 21	0 33 20	0 33 16	0 33 11	0 33 7	0 33 1	0 32 56	0 32 50	60
62	0 38 37	0 38 36	0 38 36	0 38 35	0 38 31	0 38 27	0 38 23	0 38 18	0 38 13	0 38 8	62
64	0 43 42	0 43 42	0 43 41	0 43 41	0 43 38	0 43 34	0 43 31	0 43 25	0 43 18	0 43 14	64
66	0 48 36	0 48 36	0 48 37	0 48 37	0 48 34	0 48 30	0 48 27	0 48 21	0 48 16	0 48 10	66
68	0 53 15	0 53 16	0 53 16	0 53 17	0 53 14	0 53 10	0 53 7	0 53 1	0 52 56	0 52 50	68
70	0 57 40	0 57 41	0 57 41	0 57 42	0 57 39	0 57 36	0 57 33	0 57 27	0 57 22	0 57 16	70
72	1 1 45	1 1 47	1 1 48	1 1 50	1 1 47	1 1 44	1 1 41	1 1 35	1 1 28	1 1 21	72
74	1 5 32	1 5 34	1 1 35	1 5 37	1 5 34	1 5 32	1 5 29	1 5 23	1 5 16	1 5 10	74
76	1 8 57	1 8 59	1 9 1	1 9 3	1 9 0	1 8 56	1 8 53	1 8 47	1 8 40	1 8 34	76
78	1 11 57	1 11 59	1 12 1	1 12 3	1 12 0	1 11 58	1 11 55	1 11 49	1 11 42	1 11 36	78
80	1 14 33	1 14 36	1 14 38	1 14 41	1 14 38	1 14 36	1 14 33	1 14 26	1 14 20	1 14 13	80
82	1 16 43	1 16 45	1 16 48	1 16 50	1 16 47	1 16 44	1 16 41	1 16 35	1 16 28	1 16 22	82
84	1 18 26	1 18 29	1 18 33	1 18 36	1 18 33	1 18 30	1 18 27	1 18 20	1 18 13	1 18 6	84
86	1 19 40	1 19 43	1 19 45	1 19 48	1 19 46	1 19 43	1 19 41	1 19 34	1 19 27	1 19 20	86
88	1 20 22	1 20 25	1 20 28	1 20 30	1 20 28	1 20 25	1 20 23	1 20 16	1 20 9	1 20 02	88
90	1 20 38	1 20 41	1 20 44	1 20 47	1 20 45	1 20 43	1 20 41	1 20 34	1 20 27	1 20 20	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

MEAN ANOMALY 3 Signs.

Apoge ☽ 1° Ti. equ. à ☉	10°			11°			12°			13°			14°			15°			16°			17°			18°			19°			Apoge ☽ 1° Ti. equ. à ☉
	A.			A.			A.			A.			A.			A.			A.			A.			A.			A.			
°	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°
0	1	21	28	1	21	30	1	21	32	1	21	30	1	21	29	1	21	27	1	21	20	1	21	12	1	21	5	1	20	53	0
2	1	21	14	1	21	15	1	21	17	1	21	15	1	21	13	1	21	11	1	21	4	1	20	58	1	20	51	1	20	39	2
4	1	20	45	1	20	47	1	20	48	1	20	46	1	20	45	1	20	43	1	20	36	1	20	30	1	20	23	1	20	11	4
6	1	19	59	1	20	1	1	20	2	1	20	1	1	20	0	1	19	59	1	19	52	1	19	46	1	19	39	1	19	27	6
8	1	18	49	1	18	51	1	18	52	1	18	51	1	18	50	1	18	49	1	18	43	1	18	36	1	18	30	1	18	18	8
10	1	17	21	1	17	22	1	17	24	1	17	23	1	17	22	1	17	21	1	17	15	1	17	10	1	17	4	1	16	52	10
12	1	15	37	1	15	38	1	15	40	1	15	39	1	15	39	1	15	38	1	15	32	1	15	26	1	15	20	1	15	9	12
14	1	13	32	1	13	34	1	13	35	1	13	35	1	13	34	1	13	34	1	13	28	1	13	22	1	13	16	1	13	6	14
16	1	11	10	1	11	12	1	11	15	1	11	13	1	11	12	1	11	10	1	11	6	1	11	1	1	10	57	1	10	47	16
18	1	8	29	1	11	31	1	8	33	1	8	33	1	8	32	1	8	32	1	8	27	1	8	23	1	8	18	1	8	9	18
20	1	5	31	1	5	34	1	5	36	1	5	36	1	5	36	1	5	36	1	5	31	1	5	26	1	5	21	1	5	13	20
22	1	3	18	1	3	21	1	2	24	1	2	24	1	2	24	1	2	25	1	2	20	1	2	16	1	2	11	1	2	3	22
24	0	58	53	0	58	56	0	58	50	0	58	54	0	58	57	0	59	1	0	58	57	0	58	53	0	58	49	0	58	42	24
26	0	55	0	0	55	3	0	55	7	0	55	8	0	55	10	0	55	11	0	55	7	0	55	2	0	54	58	0	54	52	26
28	0	50	57	0	51	2	0	51	7	0	51	8	0	51	10	0	51	11	0	51	7	0	51	4	0	51	0	0	50	55	28
30	0	46	44	0	46	48	0	46	51	0	46	53	0	46	54	0	46	56	0	46	53	0	46	51	0	46	48	0	46	43	30
32	0	42	18	0	42	21	0	42	25	0	42	27	0	42	28	0	42	30	0	42	28	0	42	26	0	42	24	0	42	20	32
34	0	37	41	0	37	45	0	37	49	0	37	51	0	37	53	0	37	55	0	37	54	0	37	54	0	37	53	0	37	50	34
36	0	32	48	0	32	52	0	32	57	0	32	59	0	33	2	0	33	4	0	33	3	0	33	3	0	33	2	0	33	0	36

44	0 11 49	0 11 55	0 12 0	0 12 5	0 12 9	0 12 14	0 12 16	0 12 19	0 12 21	0 12 24	44
46	0 6 17	0 6 23	0 6 28	0 6 33	0 6 39	0 6 44	0 6 48	0 6 51	0 6 55	0 6 59	46
48	0 0 42	0 0 48	0 0 53	0 0 59	0 1 4	0 1 10	0 1 14	0 1 19	0 1 23	0 1 28	48
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
50	0 4 55	0 4 51	0 4 46	0 4 39	0 4 33	0 4 26	0 4 19	0 4 13	0 4 6	0 4 1	50
52	0 10 34	0 10 30	0 10 25	0 10 18	0 10 11	0 10 4	0 9 56	0 9 49	0 9 41	0 9 34	52
54	0 16 13	0 16 8	0 16 2	0 15 54	0 15 47	0 15 39	0 15 31	0 15 22	0 15 14	0 15 6	54
56	0 21 47	0 21 40	0 21 34	0 21 26	0 21 19	0 21 11	0 21 3	0 20 54	0 20 45	0 20 35	56
58	0 27 18	0 27 11	0 27 4	0 26 56	0 26 48	0 26 40	0 26 30	0 26 21	0 26 11	0 26 0	58
60	0 32 42	0 32 35	0 32 27	0 32 18	0 32 10	0 32 1	0 31 51	0 31 40	0 31 30	0 31 17	60
62	0 38 0	0 37 52	0 37 44	0 37 34	0 37 25	0 37 15	0 37 4	0 36 53	0 36 43	0 36 28	62
64	0 43 6	0 42 57	0 42 49	0 42 40	0 42 30	0 42 21	0 42 9	0 41 56	0 41 44	0 41 28	64
66	0 48 1	0 47 52	0 47 43	0 47 33	0 47 22	0 47 12	0 47 0	0 46 47	0 46 34	0 46 16	65
68	0 52 41	0 52 33	0 52 24	0 52 12	0 52 1	0 51 49	0 51 36	0 51 22	0 51 9	0 50 50	68
70	0 57 7	0 56 58	0 56 49	0 56 37	0 56 24	0 56 12	0 55 58	0 55 43	0 55 29	0 55 10	70
72	1 1 11	1 1 1	1 0 51	1 0 40	1 0 28	1 0 17	1 0 2	0 59 47	0 59 32	0 59 11	72
74	1 5 1	1 4 51	1 4 42	1 4 29	1 4 15	1 4 2	1 3 46	1 3 30	1 3 14	1 2 53	74
76	1 8 25	1 8 15	1 8 6	1 7 53	1 7 39	1 7 26	1 7 9	1 6 52	1 6 35	1 6 13	76
78	1 11 26	1 11 16	1 11 6	1 10 52	1 10 38	1 10 24	1 10 7	1 9 50	1 9 33	1 9 10	78
80	1 14 3	1 13 53	1 13 43	1 13 29	1 13 15	1 13 1	1 12 43	1 12 25	1 12 7	1 11 44	80
82	1 16 11	1 16 0	1 15 49	1 15 34	1 15 18	1 15 3	1 14 46	1 14 30	1 14 13	1 13 49	82
84	1 17 56	1 17 47	1 17 37	1 17 22	1 17 7	1 16 52	1 16 34	1 16 15	1 15 57	1 15 32	84
86	1 19 10	1 19 0	1 18 50	1 18 35	1 18 19	1 18 4	1 17 45	1 17 27	1 17 8	1 16 43	86
88	1 19 52	1 19 42	1 19 32	1 19 17	1 19 1	1 18 46	1 18 27	1 18 8	1 17 49	1 17 24	88
90	1 20 10	1 20 0	1 19 50	1 19 35	1 19 19	1 19 4	1 18 44	1 18 25	1 18 5	1 17 40	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

Mean Anomaly 3 Signs.

Apogé ☽ 1° Ti. equat ☉	20°			21°			22°			23°			24°			25°			26°			27°			28°			29°			Apogé ☽ 1° Ti. equat ☉
	A.			A.			A.			A.			A.			A.			A.			A.			A.			A.			
°	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°
0	1	20	42	1	20	30	1	20	12	1	19	54	1	19	36	1	19	14	1	18	52	1	18	29	1	18	1	1	17	34	0
2	1	20	27	1	20	15	1	19	57	1	19	39	1	19	21	1	19	0	1	18	37	1	18	14	1	17	47	1	17	20	2
4	1	20	0	1	19	48	1	19	30	1	19	13	1	18	55	1	18	33	1	18	10	1	17	48	1	17	21	1	16	54	4
6	1	19	15	1	19	3	1	18	45	1	18	28	1	18	10	1	17	48	1	17	26	1	17	4	1	16	37	1	16	11	6
8	1	18	7	1	17	55	1	17	38	1	17	21	1	17	4	1	16	42	1	16	20	1	15	58	1	15	32	1	15	5	8
10	1	16	40	1	16	28	1	16	11	1	15	55	1	15	38	1	15	17	1	14	55	1	14	34	1	14	8	1	13	43	10
12	1	14	59	1	14	48	1	14	31	1	14	15	1	13	58	1	13	37	1	13	16	1	12	55	1	12	30	1	12	5	12
14	1	12	55	1	12	45	1	12	29	1	12	13	1	11	57	1	11	37	1	11	17	1	10	57	1	10	33	1	10	9	14
16	1	10	38	1	10	28	1	10	12	1	9	57	1	9	41	1	9	22	1	9	2	1	8	44	1	8	21	1	7	57	16
18	1	8	0	1	7	50	1	7	35	1	7	20	1	7	5	1	6	47	1	6	29	1	6	11	1	5	48	1	5	26	18
20	1	5	4	1	4	56	1	4	42	1	4	28	1	4	14	1	3	56	1	3	39	1	3	21	1	3	0	1	2	38	20
22	1	1	54	1	1	46	1	1	33	1	1	20	1	1	7	1	0	51	1	0	34	1	0	18	0	59	58	0	59	38	22
24	0	58	34	0	58	27	0	58	14	0	58	1	0	57	50	0	57	35	0	57	20	0	57	5	0	56	46	0	56	28	24
26	0	54	45	0	54	39	0	54	27	0	54	16	0	54	4	0	53	50	0	53	37	0	53	23	0	53	6	0	52	49	26
28	0	50	49	0	50	44	0	59	33	0	50	21	0	50	10	0	49	58	0	49	46	0	49	35	0	49	19	0	49	4	28
30	0	46	39	0	46	34	0	46	25	0	46	15	0	46	6	0	45	55	0	45	45	0	45	34	0	45	19	0	45	5	30
32	0	42	16	0	42	12	0	42	4	0	41	57	0	41	49	0	41	39	0	41	30	0	41	20	0	41	8	0	40	56	32
34	0	37	46	0	37	43	0	37	37	0	37	30	0	37	24	0	37	16	0	37	8	0	37	0	0	36	49	0	36	38	34
36	0	32	58	0	32	56	0	32	51	0	32	45	0	32	40	0	32	34	0	32	27	0	32	21	0	32	11	0	32	0	36
38	0	28	0	0	28	[illegible]	0	27	[illegible]	0	27	53	0	27	[illegible]	0	27	[illegible]	0	27	[illegible]	0	27	[illegible]	0	27	29	0	27	[illegible]	38

42	0 17 46	0 17 47	0 17 46	0 17 45	0 17 44	0 17 43	0 17 41	0 17 41	0 17 38	0 17 35	42
44	0 12 26	0 12 29	0 12 30	0 12 31	0 12 32	0 12 32	0 12 33	0 12 33	0 12 33	0 12 32	44
46	0 7 3	0 7 7	0 7 10	0 7 12	0 7 15	0 7 17	0 7 20	0 7 22	0 7 23	0 7 23	46
48	0 1 34	0 1 39	0 1 43	0 1 47	0 1 51	0 1 56	0 2 0	0 2 5	0 2 8	0 2 12	48
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
50	0 3 55	0 3 50	0 3 45	0 3 39	0 3 34	0 3 28	0 3 21	0 3 15	0 3 9	0 3 3	50
52	0 9 27	0 9 20	0 9 13	0 9 7	0 9 0	0 8 51	0 8 43	0 8 34	0 8 26	0 8 18	52
54	0 14 58	0 14 50	0 14 41	0 14 31	0 14 22	0 14 11	0 14 1	0 13 51	0 13 41	0 13 31	54
56	0 20 24	0 20 14	0 20 4	0 19 53	0 19 43	0 19 31	0 19 19	0 19 7	0 18 54	0 18 42	56
58	0 25 48	0 25 36	0 25 24	0 25 12	0 25 0	0 24 46	0 24 31	0 24 16	0 24 1	0 23 47	58
60	0 31 4	0 30 51	0 30 37	0 30 23	0 30 9	0 29 53	0 29 37	0 29 21	0 29 4	0 28 48	60
62	0 36 13	0 35 58	0 35 43	0 35 27	0 35 12	0 34 54	0 34 36	0 34 18	0 33 59	0 33 39	62
64	0 41 13	0 40 57	0 40 40	0 40 23	0 40 6	0 39 46	0 39 26	0 39 6	0 38 45	0 38 23	64
66	0 46 0	0 45 41	0 45 23	0 45 5	0 44 47	0 44 25	0 44 3	0 43 41	0 43 18	0 42 55	66
68	0 50 32	0 50 13	0 49 54	0 49 34	0 49 15	0 48 51	0 48 28	0 48 4	0 47 39	0 47 13	68
70	0 54 50	0 54 31	0 54 10	0 53 48	0 53 27	0 53 2	0 52 37	0 52 12	0 51 45	0 51 18	70
72	0 58 51	0 58 30	0 58 8	0 57 45	0 57 23	0 56 57	0 56 30	0 56 4	0 55 35	0 55 6	72
74	1 2 31	1 2 10	1 1 47	1 1 23	1 1 0	1 0 32	1 0 3	0 59 35	0 59 5	0 58 34	74
76	1 5 59	1 5 28	1 5 4	1 4 39	1 4 15	1 3 46	1 3 16	1 2 47	1 2 15	1 1 43	76
78	1 8 47	1 8 24	1 7 58	1 7 33	1 7 7	1 6 37	1 6 7	1 5 37	1 5 4	1 4 30	78
80	1 11 20	1 10 57	1 10 30	1 10 3	1 9 36	1 9 5	1 8 33	1 8 4	1 7 29	1 6 54	80
82	1 13 26	1 13 2	1 12 35	1 12 8	1 11 41	1 11 9	1 10 38	1 10 6	1 9 31	1 8 55	82
84	1 15 7	1 14 42	1 14 15	1 13 47	1 13 20	1 12 47	1 12 13	1 11 42	1 11 6	1 10 30	84
86	1 16 19	1 15 54	1 15 26	1 14 58	1 14 29	1 13 56	1 13 23	1 12 50	1 12 13	1 11 37	86
88	1 17 0	1 16 34	1 16 6	1 15 37	1 15 9	1 14 36	1 14 3	1 13 30	1 12 53	1 12 16	88
90	1 17 16	1 16 51	1 16 22	1 15 54	1 15 25	1 14 52	1 14 19	1 13 46	1 13 9	1 12 31	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

MEAN ANOMALY 4 Signs.

Apoge ☽ 1° Ti. equat. à ☉.	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	Apoge ☽ 1° Ti. equat. à ☉.
	A.	A.	A.	A.	A.	A.	A.	A.	A.	A.	
°	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	°
0	1 17 6	1 16 32	1 15 59	1 15 25	1 14 46	1 14 8	1 13 29	1 12 45	1 12 0	1 11 16	0
2	1 16 52	1 16 18	1 15 44	1 15 11	1 14 32	1 13 54	1 13 15	1 12 31	1 11 48	1 11 4	2
4	1 16 27	1 15 53	1 15 20	1 14 46	1 14 7	1 13 29	1 12 50	1 12 6	1 11 23	1 10 39	4
6	1 15 44	1 15 11	1 14 38	1 14 5	1 13 27	1 12 48	1 12 10	1 11 27	1 10 43	1 10 0	6
8	1 14 39	1 14 6	1 13 34	1 13 1	1 12 24	1 11 46	1 11 9	1 10 26	1 9 44	1 9 1	8
10	1 13 17	1 12 45	1 12 14	1 11 42	1 11 5	1 10 29	1 9 52	1 9 11	1 8 29	1 7 48	10
12	1 11 40	1 11 9	1 10 39	1 10 8	1 9 32	1 8 55	1 8 19	1 7 38	1 6 58	1 6 17	12
14	1 9 45	1 9 15	1 8 44	1 8 14	1 7 39	1 7 4	1 6 29	1 5 50	1 5 10	1 4 31	14
16	1 7 34	1 7 5	1 6 36	1 6 7	1 5 33	1 4 59	1 4 25	1 3 47	1 3 9	1 2 31	16
18	1 5 3	1 4 35	1 4 8	1 3 40	1 3 7	1 2 35	1 2 2	1 1 26	1 0 49	1 0 13	18
20	1 1 17	1 1 51	1 1 24	1 0 58	1 0 27	0 59 55	0 59 25	0 58 50	0 58 15	0 57 40	20
22	0 59 13	0 58 53	0 58 28	0 58 3	0 57 34	0 57 5	0 56 36	0 56 2	0 55 29	0 54 55	22
24	0 56 9	0 55 45	0 55 22	0 54 58	0 54 31	0 54 3	0 53 36	0 53 5	0 52 33	0 52 2	24
26	0 52 32	0 52 10	0 51 49	0 51 27	0 51 1	0 50 35	0 50 10	0 49 41	0 49 11	0 48 42	26
28	0 48 48	0 48 28	0 48 8	0 47 48	0 47 25	0 47 2	0 46 39	0 46 12	0 45 41	0 45 17	28
30	0 44 50	0 44 32	0 44 14	0 43 57	0 43 36	0 43 14	0 42 53	0 42 31	0 42 8	0 41 46	30
32	0 40 44	0 40 28	0 40 12	0 39 56	0 39 37	0 39 17	0 33 58	0 38 36	0 38 15	0 37 53	32
34	0 36 27	0 36 14	0 36 0	0 35 47	0 35 30	0 35 14	0 34 57	0 34 37	0 34 18	0 33 58	34
36	0 31 50	0 31 40	0 31 31	0 31 21	0 31 7	0 30 53	0 30 39	0 30 22	0 30 6	0 29 49	36
38	0 27 16	0 27 7	0 26 57	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	38

42	0 17 32	0 17 28	0 17 23	0 17 19	0 17 13	0 17 8	0 17 2	0 16 54	0 16 47	0 16 39	42
44	0 12 30	0 12 28	0 12 27	0 12 25	0 12 22	0 12 19	0 12 16	0 12 11	0 12 7	0 12 2	44
46	0 7 24	0 7 25	0 7 27	0 7 28	0 7 28	0 7 28	0 7 27	0 7 26	0 7 24	0 7 23	46
48	0 2 15	0 2 19	0 2 22	0 2 26	0 2 28	0 2 31	0 2 33	0 2 35	0 2 38	0 2 40	43
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
50	0 2 57	0 2 51	0 2 44	0 2 38	0 2 33	0 2 27	0 2 22	0 2 17	0 2 12	0 2 7	50
52	0 8 10	0 8 1	0 7 53	0 7 44	0 7 35	0 7 27	0 7 18	0 7 9	0 7 1	0 6 52	52
54	0 13 21	0 13 10	0 12 58	0 12 47	0 12 35	0 12 24	0 12 12	0 12 0	0 11 48	0 11 36	54
56	0 18 29	0 18 15	0 18 1	0 17 47	0 17 32	0 17 18	0 17 3	0 16 48	0 16 32	0 16 17	56
58	0 23 33	0 23 16	0 23 0	0 22 43	0 22 25	0 22 7	0 21 49	0 21 31	0 21 13	0 20 55	58
60	0 28 31	0 28 12	0 27 54	0 27 35	0 27 14	0 26 52	0 26 31	0 26 9	0 25 48	0 25 23	60
62	0 33 20	0 32 59	0 32 38	0 32 17	0 31 54	0 31 30	0 31 7	0 30 42	0 30 17	0 39 52	62
64	0 38 2	0 37 38	0 37 14	0 36 50	0 36 24	0 35 58	0 35 32	0 35 4	0 34 36	0 34 8	64
66	0 42 32	0 42 6	0 41 40	0 41 14	0 40 45	0 40 16	0 39 47	0 39 16	0 38 45	0 38 14	65
68	0 46 48	0 46 20	0 45 51	0 45 23	0 44 52	0 44 21	0 43 50	0 43 16	0 42 43	0 42 9	68
70	0 50 51	0 50 21	0 49 50	0 49 20	0 48 46	0 48 12	0 47 38	0 47 2	0 46 25	0 45 49	70
72	0 54 37	0 54 4	0 53 31	0 52 58	0 52 23	0 51 47	0 51 12	0 50 33	0 49 53	0 49 14	72
74	0 58 4	0 57 29	0 56 54	0 56 19	0 55 42	0 55 5	0 54 28	0 53 47	0 53 6	0 52 25	74
76	1 1 11	1 0 35	0 59 58	0 59 22	0 58 43	0 58 4	0 57 25	0 56 42	0 56 0	0 55 16	76
78	1 3 57	1 3 19	1 2 41	1 2 3	1 1 23	1 0 42	1 0 2	0 59 17	0 58 32	0 57 47	78
80	1 6 20	1 5 41	1 5 1	1 4 22	1 3 40	1 2 58	1 2 16	1 1 30	1 0 43	0 59 57	80
82	1 8 20	1 7 40	1 7 0	1 6 20	1 5 37	1 4 53	1 4 10	1 3 22	1 2 35	1 1 47	82
84	1 9 53	1 9 12	1 8 31	1 7 50	1 7 6	1 6 22	1 5 38	1 4 50	1 4 1	1 3 13	84
86	1 11 0	1 10 19	1 9 37	1 8 56	1 8 11	1 7 26	1 6 41	1 5 52	1 5 3	1 4 14	86
88	1 11 39	1 10 57	1 10 16	1 9 34	1 8 48	1 8 3	1 7 17	1 6 27	1 5 38	1 4 48	88
90	1 11 54	1 11 12	1 10 30	1 9 48	1 9 3	1 8 17	1 7 32	1 6 42	1 5 52	1 5 2	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

Mean Anomaly 4 Signs.

Apoge ☽ 1° Ti. equat. à ☉	10°			11°			12°			13°			14°			15°			16°			17°			18°			19°			Apoge ☽ 1° Ti. equat. à ☉
	A.			A.			A.			A.			A.			A.			A.			A.			A.			A.			
°	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°
0	1	10	26	1	9	36	1	8	46	1	7	52	1	6	57	1	6	3	1	5	3	1	4	3	1	3	3	1	1	57	0
2	1	10	14	1	9	24	1	8	34	1	7	40	1	6	46	1	5	52	1	4	52	1	3	51	1	2	51	1	1	46	2
4	1	9	50	1	9	0	1	8	11	1	7	17	1	6	22	1	5	28	1	4	29	1	3	29	1	2	30	1	1	25	4
6	1	9	11	1	8	23	1	7	34	1	6	41	1	5	47	1	4	54	1	3	54	1	2	55	1	1	55	1	0	51	6
8	1	8	12	1	7	24	1	6	35	1	5	42	1	4	50	1	3	57	1	2	59	1	2	0	1	1	2	0	59	59	8
10	1	7	0	1	6	13	1	5	25	1	4	33	1	3	41	1	2	49	1	1	52	1	0	55	0	59	58	0	58	55	10
12	1	5	31	1	4	46	1	4	0	1	3	9	1	2	17	1	1	26	1	0	30	0	59	35	0	58	39	0	57	38	12
14	1	3	46	1	3	1	1	2	16	1	1	26	1	0	37	0	59	47	0	58	58	0	57	59	0	57	5	0	56	6	14
16	1	1	48	1	1	4	1	0	21	0	59	33	0	58	46	0	57	58	0	57	5	0	56	13	0	55	20	0	54	23	16
18	0	59	31	0	58	48	0	58	6	0	57	21	0	56	36	0	55	51	0	55	0	0	54	8	0	53	17	0	52	22	18
20	0	57	0	0	56	20	0	55	40	0	54	57	0	54	13	0	53	30	0	52	41	0	51	53	0	51	4	0	50	12	20
22	0	54	17	0	53	40	0	53	2	0	52	20	0	51	39	0	50	57	0	50	11	0	49	25	0	48	39	0	47	49	22
24	0	51	26	0	50	51	0	50	15	0	49	36	0	48	56	0	48	17	0	47	33	0	46	49	0	46	5	0	45	18	24
26	0	48	9	0	47	35	0	47	2	0	46	26	0	45	49	0	45	13	0	44	32	0	43	51	0	43	10	0	42	27	26
28	0	44	47	0	44	16	0	43	46	0	43	14	0	42	40	0	42	4	0	41	26	0	40	47	0	40	9	0	39	29	28
30	0	41	16	0	40	47	0	40	17	0	39	46	0	39	14	0	38	43	0	38	8	0	37	34	0	36	59	0	36	22	30
32	0	37	28	0	37	3	0	36	38	0	36	10	0	35	42	0	35	14	0	34	43	0	34	11	0	33	40	0	33	7	32
34	0	33	36	0	33	13	0	32	51	0	32	26	0	32	2	0	31	37	0	31	9	0	30	41	0	30	13	0	29	43	34
36	0	29	30	0	29	10	0	28	51	0	28	30	0	28	8	0	27	47	0	27	23	0	27	0	0	26	35	0	26	9	36
38																															38

42	0 10 30	0 10 20	0 10 11	0 10 0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
44	0 11 57	0 11 52	0 11 47	0 11 40	0 11 33	0 11 26	0 11 18	0 11 10	0 11 2	0 10 53	44
46	0 7 21	0 7 20	0 7 18	0 7 15	0 7 11	0 7 8	0 7 5	0 7 1	0 6 58	0 6 53	46
48	0 2 41	0 2 43	0 2 44	0 2 45	0 2 46	0 2 47	0 2 48	0 2 49	0 2 50	0 2 49	48
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
50	0 2 2	0 1 57	0 1 52	0 1 47	0 1 42	0 1 37	0 1 32	0 1 27	0 1 22	0 1 20	50
52	0 6 44	0 6 36	0 6 28	0 6 18	0 6 7	0 5 57	0 5 48	0 5 40	0 5 31	0 5 25	52
54	0 11 24	0 11 12	0 11 0	0 10 47	0 10 34	0 10 21	0 10 7	0 9 53	0 9 39	0 9 27	54
56	0 16 2	0 15 46	0 15 31	0 15 14	0 14 57	0 14 40	0 14 22	0 14 4	0 13 46	0 13 29	56
58	0 20 35	0 20 14	0 19 56	0 19 35	0 19 14	0 18 53	0 18 32	0 18 10	0 17 49	0 17 27	58
60	0 25 4	0 24 41	0 24 19	0 23 54	0 23 29	0 23 4	0 22 38	0 22 12	0 21 46	0 21 21	60
62	0 29 26	0 29 0	0 28 33	0 28 4	0 27 36	0 27 7	0 26 38	0 26 9	0 25 40	0 25 9	62
64	0 33 39	0 33 30	0 32 40	0 32 8	0 31 36	0 31 4	0 30 31	0 29 58	0 29 25	0 28 50	64
66	0 37 42	0 37 9	0 36 37	0 36 1	0 35 25	0 34 49	0 34 13	0 33 36	0 33 0	0 32 21	66
68	0 41 33	0 40 58	0 40 22	0 39 43	0 39 4	0 38 25	0 37 45	0 37 4	0 36 24	0 35 38	68
70	0 45 11	0 44 33	0 43 55	0 43 13	0 42 32	0 41 50	0 41 8	0 40 26	0 39 44	0 38 55	70
72	0 48 33	0 47 53	0 47 12	0 46 27	0 45 43	0 44 58	0 44 11	0 43 24	0 42 37	0 41 38	72
74	0 51 41	0 50 58	0 50 14	0 49 27	0 48 39	0 47 52	0 47 2	0 46 12	0 45 22	0 44 29	74
76	0 54 30	0 53 45	0 52 59	0 52 9	0 51 19	0 50 29	0 49 37	0 48 44	0 47 52	0 46 56	76
78	0 56 59	0 56 11	0 55 23	0 54 31	0 53 39	0 52 47	0 51 53	0 50 58	0 50 4	0 49 6	78
80	0 59 8	0 58 18	0 57 29	0 56 35	0 55 41	0 54 47	0 53 51	0 52 54	0 51 58	0 50 58	80
82	1 0 56	1 0 5	0 59 14	0 58 19	0 57 23	0 56 28	0 55 30	0 54 33	0 53 35	0 52 33	82
84	1 2 21	1 1 29	1 0 37	0 59 40	0 58 44	0 57 47	0 56 48	0 55 50	0 54 51	0 53 46	84
86	1 3 21	1 2 29	1 1 36	1 0 38	0 59 40	0 58 42	0 57 42	0 56 41	0 55 41	0 54 36	86
88	1 3 55	1 3 1	1 2 8	1 1 10	1 0 11	0 59 13	0 58 13	0 57 12	0 56 12	0 55 6	88
90	1 4 9	1 3 15	1 2 22	1 1 24	1 0 25	0 59 27	0 58 26	0 57 25	0 56 24	0 55 19	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

MEAN ANOMALY 4 Signs.

Apogé ☽ 1° Tr. equa. à ☉	20°			21°			22°			23°			24°			25°			26°			27°			28°			29°			Apoge ☽ 1° Tr. equat. à ☉
	A.			A.			A.			A.			A.			A.			A.			A.			A.			A.			
°	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°
0	1	0	52	0	59	46	0	58	35	0	57	23	0	56	12	0	54	57	0	53	43	0	52	28	0	51	8	0	49	48	0
2	1	0	40	0	59	35	0	58	24	0	57	13	0	56	2	0	54	47	0	53	33	0	52	18	0	50	58	0	49	39	2
4	1	0	20	0	59	15	0	58	5	0	56	50	0	55	46	0	54	31	0	53	16	0	52	1	0	50	42	0	49	22	4
6	0	59	47	0	58	43	0	57	33	0	56	24	0	55	14	0	54	0	0	52	47	0	51	33	0	50	15	0	48	56	6
8	0	58	55	0	57	52	0	56	44	0	55	35	0	54	27	0	53	14	0	52	2	0	50	49	0	49	32	0	48	15	8
10	0	57	53	0	56	50	0	55	43	0	54	35	0	53	28	0	52	17	0	51	5	0	49	54	0	48	39	0	47	23	10
12	0	56	37	0	55	36	0	54	30	0	53	24	0	52	19	0	51	9	0	50	0	0	48	50	0	47	36	0	46	21	12
14	0	55	7	0	54	8	0	53	4	0	52	1	0	50	57	0	49	49	0	48	41	0	47	33	0	46	21	0	45	8	14
16	0	53	26	0	52	29	0	51	28	0	50	27	0	49	26	0	48	20	0	47	13	0	46	7	0	44	56	0	43	44	16
18	0	51	26	0	50	31	0	49	32	0	48	34	0	47	35	0	46	31	0	45	27	0	44	23	0	43	17	0	42	11	18
20	0	49	19	0	48	27	0	47	31	0	46	34	0	45	38	0	44	36	0	43	35	0	42	33	0	41	29	6	40	24	20
22	0	46	59	0	46	9	0	45	16	0	44	23	0	43	30	0	42	31	0	41	33	0	40	34	0	39	32	0	38	31	22
24	0	44	32	0	43	45	0	42	55	0	42	5	0	41	15	0	40	19	0	39	23	0	38	27	0	37	29	0	36	31	24
26	0	41	44	0	41	1	0	40	14	0	39	27	0	38	40	0	37	47	0	36	55	0	36	2	0	35	9	0	34	15	26
28	0	38	49	0	38	9	0	37	26	0	36	44	0	36	1	0	35	12	0	34	22	0	33	33	0	32	43	0	31	52	28
30	0	35	45	0	35	8	0	34	30	0	33	58	0	33	13	0	32	27	0	31	41	0	30	55	0	30	9	0	29	22	30
32	0	32	33	0	32	0	0	31	22	0	30	44	0	30	6	0	29	27	0	28	49	0	28	10	0	27	28	0	26	46	32
34	0	29	14	0	28	44	0	28	10	0	27	37	0	27	3	0	26	28	0	25	54	0	25	19	0	24	41	0	24	4	34
36	0	25	44	0	25	18	0	24	48	0	24	19	0	23	40	0	23	19	0	22	48	0	22	[illegible]	0	21	45	0	21	12	36
38	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	38

40	0 18 25	0 18 7	0 17 40	0 17 20	0 17 5	0 16 44	0 16 25	0 16 2	0 15 [illegible]	0 15 [illegible]	40
42	0 14 37	0 14 24	0 14 8	0 13 51	0 13 35	0 13 19	0 13 3	0 12 47	0 12 28	0 12 10	42
44	0 10 44	0 10 35	0 10 24	0 10 12	0 10 1	0 9 50	0 9 39	0 9 28	0 9 14	0 9 1	44
46	0 6 49	0 6 44	0 6 37	0 6 30	0 6 23	0 6 17	0 6 11	0 6 5	0 5 57	0 5 48	46
43	0 2 49	0 2 48	0 2 46	0 2 45	0 2 43	0 2 42	0 2 40	0 2 39	0 2 36	0 2 33	48
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
50	0 1 17	0 1 15	0 1 12	0 1 8	0 1 5	0 1 1	0 0 57	0 0 53	0 0 49	0 0 45	50
52	0 5 18	0 5 12	0 5 3	0 4 54	0 4 45	0 4 36	0 4 28	0 4 19	0 4 9	0 4 0	52
54	0 9 16	0 9 4	0 8 50	0 8 37	0 8 23	0 8 10	0 7 56	0 7 43	0 7 29	0 7 14	54
56	0 13 13	0 12 56	0 12 38	0 12 20	0 12 2	0 11 43	0 11 25	0 11 6	0 10 46	0 10 27	56
58	0 17 6	0 16 44	0 16 22	0 16 0	0 15 37	0 15 13	0 14 49	0 14 25	0 14 0	0 13 36	58
60	0 20 56	0 20 31	0 20 3	0 19 35	0 19 7	0 18 39	0 18 10	0 17 42	0 17 12	0 16 43	60
62	0 24 39	0 24 8	0 23 36	0 23 4	0 22 32	0 21 59	0 21 25	0 20 52	0 20 18	0 19 43	62
64	0 28 15	0 27 40	0 27 3	0 26 27	0 25 50	0 25 12	0 24 35	0 23 57	0 23 18	0 22 39	64
66	0 31 41	0 31 2	0 30 22	0 29 41	0 29 1	0 28 19	0 27 36	0 26 54	0 26 10	0 25 26	66
68	0 34 51	0 34 15	0 33 31	0 32 46	0 32 2	0 31 16	0 30 29	0 29 43	0 28 54	0 28 5	68
70	0 38 7	0 37 18	0 36 30	0 35 42	0 34 54	0 34 3	0 33 13	0 32 22	0 31 29	0 30 36	70
72	0 40 58	0 40 8	0 39 17	0 38 25	0 37 34	0 36 40	0 35 45	0 34 51	0 33 55	0 32 56	72
74	0 43 32	0 42 43	0 41 49	0 40 54	0 40 0	0 39 1	0 38 3	0 37 4	0 36 4	0 35 5	74
76	0 46 0	0 45 4	0 44 7	0 43 9	0 42 12	0 41 11	0 40 10	0 39 9	0 38 5	0 37 0	76
78	0 48 7	0 47 9	0 46 9	0 45 9	0 44 9	0 43 5	0 42 1	0 40 57	0 39 50	0 38 44	78
80	0 49 57	0 48 57	0 47 55	0 46 52	0 45 50	0 44 43	0 43 37	0 42 30	0 41 21	0 40 12	80
82	0 51 30	0 50 28	0 49 24	0 48 20	0 47 16	0 46 8	0 45 0	0 43 52	0 42 39	0 41 27	82
84	0 52 41	0 51 36	0 50 31	0 49 25	0 48 20	0 47 10	0 46 0	0 44 48	0 43 38	0 42 25	84
86	0 53 31	0 52 26	0 51 20	0 50 14	0 49 8	0 47 57	0 46 46	0 45 35	0 44 21	0 43 6	86
88	0 54 0	0 52 54	0 51 48	0 50 41	0 49 35	0 48 23	0 47 12	0 46 0	0 44 45	0 43 29	88
90	0 54 13	0 53 8	0 52 1	0 50 53	0 49 46	0 48 34	0 47 22	0 46 10	0 44 55	0 43 39	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

MEAN ANOMALY 5 Signs.

Apoge ☽ 1° Ti. equat. à ☉	0°			1°			2°			3°			4°			5°			6°			7°			8°			9°			Apoge ☽ 1° Ti. equat. à ☉
	A.			A.			A.			A.			A.			A.			A.			A.			A.			A.			
°	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°
0	0	48	28	0	47	4	0	45	41	0	44	17	0	42	50	0	41	22	0	39	55	0	38	23	0	36	52	0	35	20	0
2	0	48	19	0	46	56	0	45	33	0	44	10	0	42	43	0	41	15	0	39	48	0	38	17	0	36	45	0	35	14	2
4	0	48	3	0	46	40	0	45	18	0	43	55	0	42	28	0	41	1	0	39	34	0	38	3	0	36	32	0	35	1	4
6	0	47	38	0	46	16	0	44	54	0	43	32	0	42	6	0	40	39	0	39	13	0	37	43	0	36	13	0	34	43	6
8	0	46	58	0	45	37	0	44	16	0	42	55	0	41	30	0	40	5	0	38	40	0	37	11	0	35	43	0	34	14	8
10	0	46	8	0	44	48	0	43	28	0	42	8	0	40	45	0	39	23	0	38	0	0	36	32	0	35	5	0	33	37	10
12	0	45	7	0	43	49	0	42	32	0	41	14	0	39	52	0	38	31	0	37	9	0	35	44	0	34	19	0	32	53	12
14	0	43	56	0	42	40	0	41	24	0	40	8	0	38	49	0	37	29	0	36	10	0	34	47	0	33	24	0	32	1	14
16	0	42	33	0	41	19	0	40	5	0	38	51	0	37	35	0	36	20	0	35	4	0	33	43	0	32	22	0	31	2	16
18	0	41	5	0	39	54	0	38	44	0	37	33	0	36	19	0	35	4	0	33	50	0	32	32	0	31	14	0	29	56	18
20	0	39	20	0	38	12	0	37	5	0	35	57	0	34	46	0	33	36	0	32	25	0	31	10	0	29	56	0	28	41	20
22	0	37	29	0	36	25	0	35	20	0	34	16	0	33	8	0	32	0	0	30	52	0	29	41	0	28	31	0	27	20	22
24	0	35	33	0	34	31	0	33	30	0	32	28	0	31	24	0	30	21	0	29	17	0	28	10	0	27	2	0	25	55	24
26	0	33	20	0	32	22	0	31	25	0	30	27	0	29	27	0	28	27	0	27	27	0	26	24	0	25	21	0	24	18	26
28	0	31	2	0	30	9	0	29	16	0	28	23	0	27	27	0	26	31	0	25	35	0	24	36	0	23	38	0	22	39	28
30	0	28	36	0	27	47	0	26	57	0	26	8	0	25	17	0	24	26	0	23	35	0	22	40	0	21	46	0	20	51	30
32	0	26	4	0	25	19	0	24	35	0	23	50	0	23	3	0	22	17	0	21	30	0	20	41	0	19	51	0	19	2	32
34	0	23	26	0	22	46	0	22	7	0	21	27	0	20	45	0	20	3	0	19	21	0	18	36	0	17	52	0	17	7	34
36	0	20	39	0	20	4	0	19	29	0	18	54	0	18	18	0	17	42	0	17	6	0	16	26	0	15	46	0	15	6	36
38	0	17	48	0	17	18	0	16	48	0	16	18	0	15	47	0	15	11	0	14	44	0	14	19	0	13	37	0	13	3	38

42	0 11 51	0 11 31	0 11 12	0 10 52	0 10 31	0 10 11	0 9 50	0 9 29	0 9 7	0 8 46	42
44	0 8 47	0 8 33	0 8 18	0 8 4	0 7 49	0 7 35	0 7 20	0 7 4	0 6 48	0 6 32	44
46	0 5 40	0 5 31	0 5 23	0 5 14	0 5 5	0 4 56	0 4 47	0 4 37	0 4 27	0 4 17	46
48	0 2 30	0 2 27	0 2 25	0 2 22	0 2 18	0 2 15	0 2 11	0 2 7	0 2 4	0 2 0	48
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
50	0 0 40	0 0 37	0 0 35	0 0 32	0 0 29	0 0 26	0 0 23	0 0 22	0 0 21	0 0 20	50
52	0 3 50	0 3 42	0 3 34	0 3 26	0 3 17	0 3 8	0 2 59	0 2 52	0 2 44	0 2 37	52
54	0 7 0	0 6 46	0 6 31	0 6 17	0 6 3	0 5 49	0 5 35	0 5 22	0 5 8	0 4 55	54
56	0 10 7	0 9 47	0 9 28	0 9 8	0 8 48	0 8 29	0 8 9	0 7 50	0 7 31	0 7 12	56
58	0 13 11	0 12 46	0 12 22	0 11 57	0 11 32	0 11 6	0 10 41	0 10 15	0 9 50	0 9 24	58
60	0 16 13	0 15 42	0 15 12	0 14 41	0 14 11	0 13 40	0 13 10	0 12 39	0 12 7	0 11 36	60
62	0 19 9	0 18 33	0 17 58	0 17 22	0 16 46	0 16 11	0 15 35	0 14 58	0 14 20	0 13 43	62
64	0 22 0	0 21 19	0 20 38	0 19 57	0 19 16	0 18 35	0 17 54	0 17 11	0 16 29	0 15 46	64
66	0 24 42	0 23 57	0 23 11	0 22 26	0 21 40	0 20 54	0 20 8	0 19 20	0 18 32	0 17 44	66
68	0 27 16	0 26 26	0 25 37	0 24 47	0 23 56	0 23 5	0 22 14	0 21 21	0 20 29	0 19 36	68
70	0 29 43	0 28 49	0 27 55	0 27 1	0 26 5	0 25 10	0 24 14	0 23 17	0 22 19	0 21 22	70
72	0 31 59	0 31 1	0 30 3	0 29 5	0 28 6	0 27 6	0 26 7	0 25 5	0 24 2	0 23 0	72
74	0 34 5	0 33 3	0 32 2	0 31 0	0 29 56	0 28 52	0 27 48	0 26 42	0 25 37	0 24 31	74
76	0 35 56	0 34 51	0 33 47	0 32 42	0 31 35	0 30 28	0 29 21	0 28 12	0 27 2	0 25 53	76
78	0 37 37	0 36 29	0 35 22	0 34 14	0 33 3	0 31 53	0 30 42	0 29 29	0 28 17	0 27 4	78
80	0 39 13	0 37 53	0 36 43	0 35 33	0 34 20	0 33 6	0 31 53	0 30 38	0 29 22	0 28 7	80
82	0 40 14	0 39 2	0 37 51	0 36 39	0 35 24	0 34 8	0 32 53	0 31 36	0 30 18	0 29 1	82
84	0 41 11	0 39 57	0 38 44	0 37 30	0 36 13	0 34 56	0 33 39	0 32 20	0 31 0	0 29 41	84
86	0 41 52	0 40 37	0 39 21	0 38 6	0 36 48	0 35 29	0 34 11	0 32 50	0 31 30	0 30 9	86
88	0 42 14	0 41 0	0 39 43	0 38 28	0 37 9	0 35 50	0 34 31	0 33 9	0 31 48	0 30 26	88
90	0 42 24	0 41 8	0 39 52	0 38 36	0 37 17	0 35 57	0 34 38	0 33 16	0 31 54	0 30 32	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

MEAN ANOMALY 5 Signs.

Apoge ☽ 1° Ti. equat. à ☉	10°			11°			12°			13°			14°			15°			16°			17°			18°			19°			Apoge ☽ 1° Ti. equat. à ☉
	A.			A.			A.			A.			A.			A.			A.			A.			A.			A.			
°	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°
0	0	33	45	0	32	11	0	30	36	0	28	58	0	27	20	0	25	42	0	24	2	0	22	22	0	20	42	0	19	0	0
2	0	33	40	0	32	5	0	30	31	0	28	53	0	27	15	0	25	37	0	23	57	0	22	18	0	20	38	0	18	56	2
4	0	33	27	0	31	54	0	30	20	0	28	43	0	27	5	0	25	28	0	23	49	0	22	10	0	20	31	0	18	50	4
6	0	33	10	0	31	37	0	30	4	0	28	28	0	26	51	0	25	15	0	23	37	0	21	58	0	20	20	0	18	40	6
8	0	32	42	0	31	10	0	29	38	0	28	4	0	26	29	0	24	55	0	23	18	0	21	40	0	20	3	0	18	24	8
10	0	32	7	0	30	37	0	29	7	0	27	34	0	26	0	0	24	27	0	22	52	0	21	17	0	19	42	0	18	5	10
12	0	31	25	0	29	58	0	28	30	0	26	59	0	25	27	0	23	56	0	22	23	0	20	49	0	19	16	0	17	41	12
14	0	30	36	0	29	10	0	27	45	0	26	16	0	24	47	0	23	18	0	21	47	0	20	17	0	18	46	0	17	14	14
16	0	29	39	0	28	15	0	26	52	0	25	25	0	23	58	0	22	32	0	21	5	0	19	38	0	18	11	0	16	41	16
18	0	28	36	0	27	17	0	25	57	0	24	34	0	23	10	0	21	47	0	20	23	0	19	0	0	17	35	0	16	8	18
20	0	27	25	0	26	8	0	24	52	0	23	32	0	22	12	0	20	52	0	19	31	0	18	10	0	16	49	0	15	26	20
22	0	26	7	0	24	54	0	23	41	0	22	25	0	21	10	0	19	54	0	18	37	0	17	19	0	16	2	0	14	43	22
24	0	24	46	0	23	37	0	22	28	0	21	16	0	20	4	0	18	52	0	17	39	0	16	26	0	15	12	0	13	58	24
26	0	23	14	0	22	9	0	21	5	0	19	57	0	18	50	0	17	42	0	16	34	0	15	25	0	14	17	0	13	6	26
28	0	21	39	0	20	38	0	19	38	0	18	35	0	17	33	0	16	30	0	15	26	0	14	23	0	13	19	0	12	13	28
30	0	19	56	0	19	1	0	18	6	0	17	8	0	16	11	0	15	13	0	14	14	0	13	16	0	12	17	0	11	16	30
32	0	18	11	0	17	21	0	16	30	0	15	38	0	14	45	0	13	53	0	13	0	0	12	6	0	11	12	0	10	16	32
34	0	16	22	0	15	36	0	14	51	0	14	4	0	13	18	0	12	31	0	11	43	0	10	54	0	10	6	0	9	16	34
36	0	14	26	0	13	47	0	13	7	0	12	26	0	11	44	0	11	3	0	10	20	0	9	38	0	8	55	0	8	10	36

42	0 8 23	0 8 0	0 7 36	0 7 12	0 6 47	0 6 23	0 6 0	0 5 35	0 5 11	0 4 45	42
44	0 6 15	0 5 58	0 5 41	0 5 23	0 5 5	0 4 47	0 4 29	0 4 11	0 3 53	0 3 34	44
46	0 4 6	0 3 56	0 3 45	0 3 33	0 3 21	0 3 9	0 2 57	0 2 46	0 2 34	0 2 21	46
48	0 1 55	0 1 50	0 1 45	0 1 40	0 1 35	0 1 30	0 1 25	0 1 19	0 1 14	0 1 8	48
	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	
50	0 0 18	0 0 17	0 0 15	0 0 14	0 0 14	0 0 13	0 0 11	0 0 9	0 0 7	0 0 7	50
52	0 2 29	0 2 22	0 2 14	0 2 7	0 2 0	0 1 52	0 1 44	0 1 36	0 1 28	0 1 21	52
54	0 4 41	0 4 26	0 4 12	0 4 0	0 3 46	0 3 32	0 3 18	0 3 3	0 2 49	0 2 35	54
56	0 6 51	0 6 31	0 6 10	0 5 50	0 5 30	0 5 10	0 4 50	0 4 29	0 4 9	0 3 48	56
58	0 8 58	0 8 31	0 8 5	0 7 39	0 7 13	0 6 47	0 6 21	0 5 54	0 5 28	0 5 1	58
60	0 11 3	0 10 31	0 9 58	0 9 26	0 8 53	0 8 21	0 7 50	0 7 18	0 6 47	0 6 13	60
62	0 13 5	0 12 26	0 11 48	0 11 10	0 10 32	0 9 54	0 9 17	0 8 39	0 8 2	0 7 21	62
64	0 15 2	0 14 18	0 13 34	0 12 50	0 12 7	0 11 28	0 10 40	0 9 57	0 9 14	0 8 28	64
66	0 16 55	0 16 6	0 15 17	0 14 28	0 13 38	0 12 49	0 12 0	0 11 10	0 10 21	0 9 29	66
68	0 18 42	0 17 49	0 16 55	0 16 0	0 15 6	0 14 11	0 13 16	0 12 21	0 11 26	0 10 29	68
70	0 20 24	0 19 25	0 18 27	0 17 27	0 16 28	0 15 28	0 14 28	0 13 28	0 12 28	0 11 26	70
72	0 21 57	0 20 55	0 19 52	0 18 48	0 17 44	0 16 40	0 15 35	0 14 30	0 13 25	0 12 18	72
74	0 23 24	0 22 17	0 21 10	0 20 2	0 18 53	0 17 45	0 16 36	0 15 26	0 14 17	0 13 6	74
76	0 24 42	0 23 32	0 22 21	0 21 9	0 19 57	0 18 45	0 17 32	0 16 18	0 15 5	0 13 50	76
78	0 25 50	0 24 37	0 23 23	0 22 8	0 20 52	0 19 37	0 18 20	0 17 3	0 15 46	0 14 28	78
80	0 26 50	0 25 34	0 24 17	0 23 0	0 21 41	0 20 23	0 19 3	0 17 42	0 16 22	0 15 1	80
82	0 27 42	0 26 23	0 25 4	0 23 44	0 22 23	0 21 3	0 19 40	0 18 18	0 16 55	0 15 32	82
84	0 28 20	0 26 59	0 25 38	0 24 15	0 22 53	0 21 30	0 20 5	0 18 40	0 17 15	0 15 49	84
86	0 28 47	0 27 24	0 26 2	0 24 38	0 23 15	0 21 51	0 20 24	0 18 58	0 17 31	0 16 4	86
88	0 29 3	0 27 40	0 26 17	0 24 52	0 23 28	0 22 3	0 20 36	0 19 9	0 17 42	0 16 14	88
90	0 29 9	0 27 46	0 26 23	0 24 58	0 23 33	0 22 8	0 20 41	0 19 15	0 17 46	0 16 18	90

Reduction *of the* Mean *to the* true Elliptic Equation ☽.

MEAN ANOMALY 5 Signs.

Apogé ☽ 1° Tl. equat. à ☉	20°			21°			22°			23°			24°			25°			26°			27°			28°			29°			Apoge ☽ 1° Tl. equat. à ☉
		A.			A.			A.			A.			A.			A.			A.			A.			A.			A.		
°	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°
0	0	17	18	0	15	36	0	13	53	0	12	11	0	10	28	0	8	43	0	7	0	0	5	14	0	3	29	0	1	45	0
2	0	17	15	0	15	33	0	13	51	0	12	8	0	10	26	0	8	42	0	6	57	0	5	13	0	3	29	0	1	44	2
4	0	17	9	0	15	28	0	13	46	0	12	5	0	10	23	0	8	39	0	6	55	0	5	11	0	3	27	0	1	44	4
6	0	17	0	0	15	19	0	13	38	0	11	58	0	10	17	0	8	34	0	6	52	0	5	9	0	3	26	0	1	43	6
8	0	16	46	0	15	7	0	13	27	0	11	48	0	10	8	0	8	27	0	6	46	0	5	5	0	3	23	0	1	42	8
10	0	16	28	0	14	51	0	13	13	0	11	36	0	9	58	0	8	18	0	6	38	0	4	58	0	3	19	0	1	39	10
12	0	16	7	0	14	32	0	12	56	0	11	21	0	9	45	0	8	7	0	6	30	0	4	52	0	3	15	0	1	37	12
14	0	15	41	0	14	9	0	12	36	0	11	2	0	9	29	0	7	54	0	6	19	0	4	44	0	3	9	0	1	35	14
16	0	15	11	0	13	41	0	12	11	0	10	41	0	9	11	0	7	39	0	6	7	0	4	35	0	3	3	0	1	32	16
18	0	14	41	0	13	14	0	11	47	0	10	20	0	8	53	0	7	24	0	5	56	0	4	27	0	2	58	0	1	29	18
20	0	14	3	0	12	40	0	11	17	0	9	54	0	8	31	0	7	6	0	5	40	0	4	15	0	2	50	0	1	25	20
22	0	13	24	0	12	5	0	10	46	0	9	27	0	8	8	0	6	46	0	5	24	0	4	2	0	2	41	0	1	21	22
24	0	12	43	0	11	28	0	10	13	0	8	57	0	7	42	0	6	25	0	5	7	0	3	50	0	2	33	0	1	17	24
26	0	11	56	0	10	45	0	9	34	0	8	24	0	7	13	0	6	1	0	4	48	0	3	36	0	2	24	0	1	12	26
28	0	11	7	0	10	1	0	8	55	0	7	49	0	6	44	0	5	36	0	4	29	0	3	21	0	2	14	0	1	7	28
30	0	10	15	0	9	14	0	8	14	0	7	13	0	6	13	0	5	10	0	4	8	0	3	5	0	2	3	0	1	2	30
32	0	9	21	0	8	25	0	7	30	0	6	35	0	5	40	0	4	43	0	3	46	0	2	50	0	1	53	0	0	57	32
34	0	8	25	0	7	35	0	6	45	0	5	56	0	5	0	0	4	15	0	3	24	0	2	33	0	1	42	0	0	51	34
																												0	0	45	36

44	0	3	14	0	2	55	0	2	30	0	2	10	0	1	57	0	1	38	0	1	19	0	1	0	0	0	40	0	0	20	44
46	0	2	8	0	1	55	0	1	43	0	1	30	0	1	18	0	1	5	0	0	53	0	0	40	0	0	27	0	0	13	46
48	0	1	1	0	0	55	0	0	49	0	0	43	0	0	37	0	0	31	0	0	25	0	0	19	0	0	13	0	0	6	48
	S.			S.			S.			S.			S.			S.			S.			S.			S.			S.			
50	0	0	6	0	0	6	0	0	6	0	0	5	0	0	5	0	0	4	0	0	3	0	0	2	0	0	1	0	0	1	50
52	0	1	15	0	1	8	0	1	1	0	0	53	0	0	46	0	0	38	0	0	31	0	0	23	0	0	15	0	0	8	52
54	0	2	22	0	2	8	0	1	54	0	1	40	0	1	26	0	1	13	0	0	57	0	0	43	0	0	29	0	0	14	54
56	0	3	28	0	3	7	0	2	46	0	2	26	0	2	5	0	1	44	0	1	24	0	1	3	0	0	42	0	0	21	56
58	0	4	33	0	4	6	0	3	39	0	3	11	0	2	44	0	2	17	0	1	49	0	1	22	0	0	55	0	0	27	58
60	0	5	38	0	5	4	0	4	30	0	3	57	0	3	23	0	2	49	0	2	15	0	1	41	0	1	7	0	0	33	60
62	0	6	41	0	6	0	0	5	20	0	4	40	0	4	0	0	3	20	0	2	40	0	2	0	0	1	20	0	0	40	62
64	0	7	41	0	6	55	0	6	9	0	5	22	0	4	36	0	3	50	0	3	4	0	2	18	0	1	32	0	0	46	64
66	0	8	38	0	7	46	0	6	54	0	6	2	0	5	10	0	4	19	0	3	28	0	2	37	0	1	45	0	0	52	66
68	0	9	31	0	8	34	0	7	37	0	6	40	0	5	43	0	4	46	0	3	50	0	2	53	0	1	55	0	0	58	68
70	0	10	23	0	9	21	0	8	19	0	7	17	0	6	15	0	5	13	0	4	10	0	3	8	0	2	5	0	1	3	70
72	0	11	12	0	10	5	0	8	58	0	7	51	0	6	44	0	5	37	0	4	30	0	3	23	0	2	15	0	1	8	72
74	0	11	56	0	10	45	0	9	34	0	8	22	0	7	11	0	6	0	0	4	48	0	3	36	0	2	24	0	1	12	74
76	0	12	35	0	11	20	0	10	5	0	8	49	0	7	34	0	6	19	0	5	3	0	3	48	0	2	32	0	1	16	76
78	0	13	10	0	11	52	0	10	33	0	9	15	0	7	56	0	6	37	0	5	17	0	3	58	0	2	39	0	1	19	78
80	0	13	40	0	12	19	0	10	57	0	9	36	0	8	14	0	6	52	0	5	29	0	4	7	0	2	45	0	1	22	80
82	0	14	8	0	12	45	0	11	19	0	9	54	0	8	28	0	7	3	0	5	39	0	4	14	0	2	49	0	1	25	82
84	0	14	24	0	12	58	0	11	32	0	10	6	0	8	42	0	7	14	0	5	48	0	4	22	0	2	55	0	1	27	84
86	0	14	37	0	13	10	0	11	43	0	10	17	0	8	50	0	7	22	0	5	54	0	4	26	0	2	57	0	1	29	86
88	0	14	47	0	13	19	0	11	51	0	10	23	0	8	55	0	7	26	0	5	58	0	4	29	0	2	59	0	1	30	88
90	0	14	51	0	13	23	0	11	54	0	10	26	0	8	57	0	7	28	0	5	58	0	4	29	0	2	59	0	1	30	90

TABLE of Conſtant Logarithms *for the* Elliptic Equation *of the* Moon.

☽ Apo. 1° Eq. ⊙ ☊	0 Signs 6	1 Signs 7	2 Signs 8	☽ Apo. 1° Eq. ⊙ ☊
0	9.941912	9.946292	9.956339	30
1	9.941917	9.946571	9.956675	29
2	9.941932	9.946857	9.957007	28
3	9.941958	9.947149	9.957330	27
4	9.941994	9.947448	9.957653	26
5	9.942040	9.947752	9.957968	25
6	9.942096	9.948062	9.958275	24
7	9.942163	9.948377	9.958575	23
8	9.942239	9.948698	9.958867	22
9	9.942326	9.949023	9.959151	21
10	9.942422	9.949353	9.959426	20
11	9.942529	9.949687	9.959691	19
12	9.942645	9.950025	9.959946	18
13	9.942771	9.950367	9.960191	17
14	9.942907	9.950712	9.960425	16
15	9.943053	9.951059	9.960648	15
16	9.943208	9.951409	9.960858	14
17	9.943372	9.951761	9.961056	13
18	9.943545	9.952115	9.961242	12
19	9.943728	9.952470	9.961414	11
20	9.943919	9.952827	9.961573	10
21	9.944120	9.953183	9.961717	9
22	9.944329	9.953540	9.961848	8
23	9.944546	9.953896	9.961963	7
24	9.944772	9.954251	9.962064	6
25	9.945006	9.954605	9.962150	5
26	9.945248	9.954957	9.962221	4
27	9.945498	9.955307	9.962276	3
28	9.945755	9.955655	9.962315	2
29	9.946020	9.955999	9.962339	1
30	9.946292	9.956339	9.962347	0
	11 Signs 5	10 Signs 4	9 Signs 3	

EQUATION *to be applied to* Half Mean Anomaly

MEAN ANOMALY.

Signs 0. ADD.

Log.	9.942		9.947		9.952		9.957		9.962	
°	′	″	′	″	′	″	′	″	′	″
0	0	0	0	0	0	0	0	0	0	0
1	0	4	0	3	0	3	0	2	0	1
2	0	8	0	7	0	5	0	4	0	3
3	0	12	0	10	0	8	0	6	0	5
4	0	16	0	13	0	11	0	9	0	7
5	0	20	0	16	0	13	0	11	0	8
6	0	24	0	20	0	16	0	13	0	10
7	0	28	0	23	0	19	0	15	0	12
8	0	31	0	26	0	21	0	17	0	13
9	0	35	0	29	0	24	0	19	0	15
10	0	39	0	33	0	27	0	21	0	17
11	0	43	0	36	0	29	0	23	0	18
12	0	46	0	39	0	32	0	25	0	20
13	0	50	0	42	0	34	0	28	0	21
14	0	54	0	45	0	37	0	30	0	23
15	0	57	0	48	0	39	0	32	0	24
16	1	1	0	51	0	42	0	33	0	26
17	1	4	0	54	0	44	0	35	0	27
18	1	8	0	57	0	46	0	37	0	29
19	1	11	0	59	0	48	0	39	0	30
20	1	14	1	2	0	51	0	41	0	32
21	1	18	1	4	0	53	0	42	0	33
22	1	21	1	7	0	55	0	44	0	34
23	1	24	1	9	0	57	0	46	0	36
24	1	26	1	12	0	59	0	47	0	37
25	1	29	1	14	1	1	0	49	0	38
26	1	32	1	17	1	3	0	50	0	39
27	1	34	1	19	1	4	0	52	0	40
28	1	37	1	21	1	6	0	53	0	41
29	1	39	1	23	1	7	0	54	0	42
30	1	42	1	25	1	9	0	55	0	43

EQUATION *to be applied to* Half Mean Anomaly ☽.

MEAN ANOMALY.

Sign 1. ADD.

Log.	9.942		9.947		9.952		9.957		9.962	
°	′	″	′	″	′	″	′	″	′	″
0	1	42	1	25	1	9	0	55	0	43
1	1	44	1	27	1	11	0	57	0	44
2	1	46	1	28	1	12	0	58	0	45
3	1	48	1	30	1	14	0	59	0	46
4	1	49	1	31	1	15	1	0	0	46
5	1	51	1	33	1	16	1	1	0	47
6	1	53	1	34	1	17	1	1	0	48
7	1	54	1	35	1	18	1	2	0	48
8	1	56	1	36	1	19	1	3	0	49
9	1	57	1	37	1	20	1	4	0	49
10	1	58	1	38	1	20	1	4	0	50
11	1	59	1	39	1	21	1	5	0	50
12	2	0	1	40	1	22	1	5	0	51
13	2	0	1	40	1	22	1	5	0	51
14	2	1	1	41	1	22	1	6	0	51
15	2	1	1	41	1	23	1	6	0	51
16	2	2	1	41	1	23	1	6	0	51
17	2	2	1	41	1	23	1	6	0	51
18	2	2	1	42	1	23	1	6	0	51
19	2	2	1	41	1	23	1	6	0	51
20	2	2	1	41	1	23	1	6	0	51
21	2	1	1	41	1	22	1	5	0	50
22	2	1	1	40	1	22	1	5	0	50
23	2	0	1	40	1	21	1	4	0	50
24	1	59	1	39	1	21	1	4	0	50
25	1	58	1	38	1	20	1	3	0	49
26	1	57	1	37	1	19	1	3	0	49
27	1	56	1	36	1	19	1	2	0	48
28	1	55	1	35	1	18	1	1	0	48
29	1	54	1	34	1	17	1	1	0	47
30	1	52	1	33	1	15	1	0	0	46

EQUATION *to be applied to* Half Mean Anomaly

MEAN ANOMALY.

Signs 2. A D D.

Log.	9.942		9.947		9.952		9.957		9.962	
°	′	″	′	″	′	″	′	″	′	″
0	1	52	1	33	1	15	1	0	0	4
1	1	51	1	31	1	14	0	59	0	4
2	1	49	1	30	1	13	0	58	0	4
3	1	47	1	28	1	11	0	57	0	4
4	1	45	1	26	1	10	0	56	0	4
5	1	43	1	25	1	8	0	54	0	4
6	1	40	1	23	1	7	0	53	0	4
7	1	38	1	21	1	5	0	52	0	4
8	1	36	1	19	1	4	0	50	0	3
9	1	33	1	17	1	2	0	49	0	38
10	1	30	1	14	1	0	0	47	0	36
11	1	28	1	12	0	58	0	46	0	35
12	1	25	1	9	0	56	0	44	0	34
13	1	22	1	7	0	54	0	42	0	32
14	1	19	1	4	0	52	0	41	0	31
15	1	16	1	2	0	50	0	39	0	30
16	1	12	0	59	0	47	0	37	0	28
17	1	9	0	56	0	45	0	35	0	27
18	1	5	0	53	0	43	0	33	0	25
19	1	2	0	50	0	40	0	31	0	24
20	0	58	0	47	0	38	0	29	0	22
21	0	55	0	44	0	35	0	27	0	20
22	0	51	0	41	0	33	0	25	0	19
23	0	47	0	38	0	30	0	23	0	17
24	0	44	0	35	0	28	0	21	0	16
25	0	40	0	32	0	25	0	19	0	14
26	0	36	0	28	0	22	0	17	0	12
27	0	32	0	25	0	20	0	15	0	11
28	0	28	0	22	0	17	0	12	0	9
29	0	24	0	19	0	14	0	10	0	7
30	0	20	0	15	0	11	0	8	0	6

EQUATION *to be applied to* Half Mean Anomaly ☽.

MEAN ANOMALY.

Signs 3. ADD.

Log.	9.942		9.947		9.952		9.957		9.962	
°	′	″	′	″	′	″	′	″	′	″
0	0	20	0	15	0	11	0	8	0	6
1	0	16	0	12	0	9	0	6	0	4
2	0	12	0	9	0	6	0	4	0	2
3	0	8	0	5	0	3	0	2	0	1
4	0	4	0	2	0	0	Sub.	0	Sub.	1
5	Sub.		Sub.	1	Sub.	2	0	2	0	3
6	0	4	0	4	0	5	0	5	0	4
7	0	8	0	8	0	7	0	7	0	6
8	0	12	0	11	0	10	0	9	0	8
9	0	16	0	14	0	13	0	11	0	10
10	0	20	0	18	0	16	0	13	0	11
11	0	24	0	21	0	18	0	16	0	13
12	0	27	0	24	0	21	0	18	0	14
13	0	31	0	27	0	24	0	20	0	16
14	0	35	0	31	0	26	0	22	0	18
15	0	39	0	34	0	29	0	24	0	19
16	0	43	0	37	0	31	0	26	0	21
17	0	46	0	40	0	34	0	28	0	22
18	0	50	0	43	0	36	0	30	0	24
19	0	53	0	46	0	38	0	32	0	25
20	0	57	0	48	0	41	0	33	0	27
21	1	0	0	51	0	43	0	35	0	28
22	1	3	0	54	0	45	0	37	0	29
23	1	6	0	56	0	47	0	39	0	31
24	1	9	0	59	0	49	0	40	0	32
25	1	12	1	1	0	51	0	42	0	33
26	1	15	1	4	0	53	0	43	0	34
27	1	18	1	6	0	55	0	45	0	36
28	1	21	1	9	0	57	0	46	0	37
29	1	23	1	11	0	59	0	48	0	38
30	1	26	1	13	1	0	0	49	0	39

EQUATION *to be applied to* Half Mean Anomaly).

MEAN ANOMALY.

Signs 4. SUBTRACT.

Log.	9·942		9·947		9·952		9·957		9·962	
°	′	″	′	″	′	″	′	″	′	″
0	1	26	1	13	1	0	0	49	0	39
1	1	29	1	15	1	2	0	50	0	40
2	1	30	1	16	1	3	0	51	0	41
3	1	32	1	18	1	5	0	52	0	42
4	1	34	1	20	1	6	0	53	0	42
5	1	36	1	21	1	7	0	54	0	43
6	1	38	1	23	1	8	0	55	0	44
7	1	39	1	24	1	9	0	56	0	44
8	1	41	1	25	1	10	0	57	0	45
9	1	42	1	26	1	11	0	57	0	45
10	1	44	1	27	1	12	0	58	0	46
11	1	45	1	28	1	13	0	58	0	46
12	1	45	1	29	1	13	0	59	0	46
13	1	46	1	29	1	13	0	59	0	46
14	1	47	1	30	1	14	1	0	0	47
15	1	47	1	30	1	14	1	0	0	47
16	1	47	1	30	1	14	1	0	0	47
17	1	48	1	30	1	15	1	0	0	47
18	1	48	1	30	1	15	1	0	0	47
19	1	48	1	30	1	15	1	0	0	47
20	1	47	1	30	1	14	1	0	0	47
21	1	47	1	30	1	14	0	59	0	47
22	1	46	1	29	1	13	0	59	0	46
23	1	45	1	29	1	13	0	58	0	46
24	1	44	1	28	1	12	0	58	0	45
25	1	43	1	27	1	12	0	57	0	45
26	1	42	1	26	1	11	0	57	0	44
27	1	41	1	25	1	10	0	56	0	44
28	1	40	1	24	1	9	0	55	0	43
29	1	38	1	22	1	8	0	54	0	43
30	1	36	1	21	1	6	0	53	0	4

QUATION *to be applied to* Half Mean Anomaly ☽.

MEAN ANOMALY.

Signs 5. SUBTRACT.

og.	9·942		9·947		9·952		9·957		9·962	
°	′	″	′	″	′	″	′	″	′	″
0	1	36	1	21	1	6	0	53	0	42
1	1	35	1	19	1	5	0	52	0	41
2	1	33	1	18	1	4	0	51	0	40
3	1	31	1	16	1	2	0	50	0	39
4	1	28	1	14	1	1	0	49	0	38
5	1	26	1	12	0	59	0	47	0	37
6	1	24	1	10	0	57	0	46	0	36
7	1	21	1	8	0	56	0	44	0	35
8	1	18	1	6	0	54	0	43	0	34
9	1	16	1	3	0	52	0	41	0	33
10	1	13	1	1	0	50	0	40	0	31
11	1	10	0	58	0	48	0	38	0	30
12	1	7	0	56	0	46	0	37	0	29
13	1	3	0	53	0	43	0	35	0	27
14	1	0	0	50	0	41	0	33	0	26
15	0	57	0	48	0	39	0	31	0	24
16	0	53	0	45	0	37	0	29	0	23
17	0	50	0	42	0	34	0	27	0	21
18	0	46	0	39	0	32	0	25	0	20
19	0	43	0	36	0	29	0	23	0	18
20	0	39	0	33	0	27	0	21	0	17
21	0	35	0	29	0	24	0	19	0	15
22	0	31	0	26	0	21	0	17	0	13
23	0	28	0	23	0	19	0	15	0	12
24	0	24	0	20	0	16	0	13	0	10
25	0	20	0	16	0	13	0	11	0	8
26	0	16	0	13	0	11	0	9	0	7
27	0	12	0	10	0	8	0	7	0	5
28	0	8	0	7	0	5	0	4	0	3
29	0	4	0	3	0	3	0	2	0	2
30	0	0	0	0	0	0	0	0	0	0

TABLE *of the Variation of the* MOON. (*According to Sir* ISAAC NEWTON.)

ADD.

☽ à ☉	0 Si. 6		Increment.	1 Si. 7		Increment.	2 Si. 8		Increment.
°	′	″	″	′	″	″	′	″	″
0	0	0	0	28	43	208	28	43	208
1	1	9	8	29	17	212	28	8	203
2	2	18	17	29	48	216	27	30	198
3	3	28	25	30	17	219	26	50	194
4	4	37	33	30	48	223	26	8	189
5	5	45	42	31	10	226	25	25	184
6	6	54	50	31	33	228	24	38	178
7	8	1	58	31	51	231	23	54	173
8	9	8	66	32	11	233	23	2	167
9	10	15	74	32	27	235	22	11	161
10	11	21	82	32	40	236	21	19	154
11	12	25	90	32	51	238	20	26	148
12	13	29	98	32	59	239	19	29	141
13	14	32	105	33	6	239	18	32	134
14	15	34	113	33	10	240	17	35	127
15	16	36	120	33	12	240	16	35	120
16	17	35	127	33	10	240	15	34	113
17	18	32	134	33	6	239	14	32	105
18	19	29	141	32	59	239	13	29	98
19	20	26	148	32	51	238	12	25	90
20	21	19	154	32	40	236	11	21	82
21	22	11	161	32	27	235	10	15	74
22	23	2	167	32	11	233	9	8	66
23	23	51	173	31	51	231	8	1	58
24	24	38	178	31	33	228	6	54	50
25	25	25	184	31	10	226	5	45	42
26	26	8	189	30	48	223	4	37	33
27	26	50	194	30	17	219	3	28	25
28	27	30	198	29	48	216	2	18	17
29	28	8	203	29	17	212	1	9	8
30	28	43	208	28	43	208	0	0	0
	11 Si. 5		Increment.	10 Si. 4		Increment.	9 Si. 3		Increment.

SUBTRACT.

TABLE *of the Variation of the* MOON.
(*According to Mr.* MACHIN.)

ADD.									
0	6	Increment.	1	7	Increment.	2	8	Increment.	Signs
′	″	″	′	″	″	′	″	″	°
0	0	0	27	43	208	27	43	208	30
1	7	8	28	15	212	27	8	203	29
2	14	17	28	46	216	26	32	198	28
3	21	25	29	14	219	25	53	194	27
4	27	33	29	40	223	25	13	189	26
5	33	42	30	4	226	24	31	184	25
6	39	50	30	26	228	23	47	178	24
7	45	58	30	46	231	23	1	173	23
8	49	66	31	2	233	22	14	167	22
9	53	74	31	18	235	21	25	161	21
10	57	82	31	31	236	20	34	154	20
11	59	90	31	41	238	19	42	148	19
13	1	98	31	49	239	18	49	141	18
14	2	105	31	55	239	17	54	134	17
15	1	113	31	59	240	16	58	127	16
16	0	120	32	0	240	16	0	120	15
16	58	127	31	59	240	15	1	113	14
17	54	134	31	55	239	14	2	105	13
18	49	141	31	49	239	13	1	98	12
19	42	148	31	41	238	11	59	90	11
20	34	154	31	31	236	10	57	82	10
21	25	161	31	18	235	9	53	74	9
22	14	167	31	3	233	8	49	66	8
23	1	173	30	46	231	7	45	58	7
23	47	178	30	26	228	6	39	50	6
24	31	184	30	4	226	5	33	42	5
25	13	189	29	40	223	4	27	33	4
25	53	194	29	14	219	3	21	25	3
26	32	198	28	46	216	2	14	17	2
27	8	203	28	15	212	1	7	8	1
27	43	208	27	43	208	0	0	0	0
1	5	Increment.	10	4	Increment	9	3	Increment.	Signs
SUBTRACT.									

☉ Mean Anomaly.	DECIMAL MULTIPLIERS *to the* Increments *in the* Variation Tables.						☉ Mean Anomaly.
Sign	0	1	2	3	4	5	Sign
°							°
0	.0000	.065	.25	.5	.751	.935	30
1	.0006	.07	.257	.507	.76	.939	29
2	.0013	.074	.264	.516	.766	.943	28
3	.0019	.079	.272	.525	.774	.946	27
4	.0025	.083	.28	.534	.782	.95	26
5	.0022	.088	.287	.543	.79	.954	25
6	.0038	.092	.295	.552	.797	.958	24
7	.0051	.098	.303	.561	.804	.961	23
8	.0064	.104	.312	.57	.81	.964	22
9	.0077	.109	.32	.578	.816	.968	21
10	.009	.115	.33	.587	.823	.971	20
11	.01	.121	.337	.596	.83	.974	19
12	.012	.126	.345	.605	.835	.977	18
13	.013	.133	.353	.614	.842	.981	17
14	.014	.14	.362	.622	.848	.985	16
15	.015	.146	.37	.63	.855	.989	15
16	.017	.152	.38	.64	.861	.993	14
17	.018	.158	.386	.647	.867	.996	13
18	.019	.165	.395	.655	.874	1.—	12
19	.023	.171	.404	.664	.88	1.—	11
20	.027	.177	.413	.672	.885	1.—	10
21	.031	.183	.422	.68	.891	1.—	9
22	.035	.19	.43	.688	.897	1.—	8
23	.038	.195	.44	.697	.902	1.—	7
24	.042	.201	.45	.705	.908	1.—	6
25	.046	.21	.457	.713	.913	1.—	5
26	.05	.217	.465	.720	.917	1.—	4
27	.054	.225	.473	.728	.922	1.—	3
28	.057	.23	.482	.736	.926	1.—	2
29	.061	.241	.49	.743	.931	1.—	1
30	.065	.25	.5	.751	.935	1.—	0
Sign	11	10	9	8	7	6	Sign

☽ -☊ ☉	Seventh Equation *of the* Moon.						☽ -☊ ☉
Sign.	0 S.		1 S.		2 S.		Sign
Sign.	6 A.		7 A.		8 A.		Sign.
°	′	″	′	″	′	″	°
0	0	0	1	10	2	1	30
1	0	2	1	12	2	2	29
2	0	5	1	14	2	4	28
3	0	7	1	16	2	5	27
4	0	10	1	18	2	6	26
5	0	12	1	20	2	7	25
6	0	15	1	22	2	8	24
7	0	17	1	24	2	9	23
8	0	19	1	26	2	10	22
9	0	22	1	28	2	11	21
10	0	24	1	30	2	12	20
11	0	27	1	32	2	12	19
12	0	29	1	34	2	13	18
13	0	32	1	35	2	14	17
14	0	34	1	37	2	15	16
15	0	36	1	39	2	15	15
16	0	39	1	41	2	16	14
17	0	41	1	42	2	16	13
18	0	43	1	44	2	17	12
19	0	46	1	46	2	17	11
20	0	48	1	47	2	18	10
21	0	50	1	49	2	18	9
22	0	52	1	50	2	19	8
23	0	55	1	52	2	19	7
24	0	57	1	53	2	19	6
25	0	59	1	55	2	19	5
26	1	1	1	56	2	20	4
27	1	4	1	57	2	20	3
28	1	6	1	59	2	20	2
29	1	8	2	0	2	20	1
30	1	10	2	1	2	20	0
Sign.	5 S.		4 S.		3 S.		Sign.
Sign.	11 A.		11 A.		9 A.		Sign.

Second Equ. Node *and* Inclination *of the* Limit *above the leaſt, viz.* 4° 59′ 35″

A D D.

Node ☊ ⊙ Sign	0		6	Incli. Limit		1		7	Incli. Limit		2		8	Incli. Limit		Node ☊ ⊙ Sign
°	°	′	″	′	″	°	′	″	′	″	°	′	″	′	″	°
0	0	0	0	17	45	1	16	41	13	22	1	18	44	4	27	30
1	0	3	3	17	45	1	18	16	13	6	1	17	13	4	11	29
2	0	6	6	17	44	1	19	44	12	49	1	15	29	3	55	28
3	0	9	8	17	44	1	21	6	12	32	1	13	43	3	40	27
4	0	12	10	17	42	1	22	23	12	15	1	11	53	3	25	26
5	0	15	12	17	40	1	23	34	11	58	1	9	55	3	11	25
6	0	18	12	17	37	1	24	39	11	41	1	7	52	2	57	24
7	0	21	10	17	33	1	25	38	11	24	1	5	44	2	43	23
8	0	24	8	17	28	1	26	31	11	7	1	3	32	2	29	22
9	0	27	4	17	22	1	27	17	10	49	1	1	14	2	16	21
10	0	29	57	17	15	1	27	58	10	31	0	58	51	2	4	20
11	0	32	49	17	8	1	28	32	10	13	0	56	24	1	53	19
12	0	35	39	17	0	1	28	59	9	55	0	53	53	1	42	18
13	0	38	26	16	52	1	29	21	9	37	0	51	17	1	31	17
14	0	41	10	16	44	1	29	35	9	18	0	48	38	1	21	16
15	0	43	53	16	35	1	29	43	8	59	0	45	54	1	11	15
16	0	46	30	16	26	1	29	45	8	40	0	43	7	1	2	14
17	0	49	7	16	17	1	29	40	8	20	0	40	16	0	53	13
18	0	51	39	16	7	1	29	28	8	0	0	37	24	0	45	12
19	0	54	8	15	56	1	29	10	7	40	0	34	26	0	38	11
20	0	56	33	15	44	1	28	46	7	21	0	31	27	0	32	10
21	0	58	54	15	32	1	28	14	7	2	0	28	25	0	26	9
22	1	1	11	15	19	1	27	37	6	44	0	25	22	0	21	8
23	1	3	24	15	6	1	26	52	6	26	0	22	16	0	16	7
24	1	5	32	14	52	1	26	1	6	8	0	19	8	0	12	6
25	1	7	36	14	38	1	25	4	5	50	0	15	59	0	8	5
26	1	9	35	14	24	1	24	1	5	33	0	12	49	0	5	4
27	1	11	30	14	9	1	22	51	5	16	0	9	38	0	3	3
28	1	13	19	13	54	1	21	35	4	59	0	6	26	0	1	2
29	1	15	2	13	38	1	20	12	4	43	0	3	13	0	0	1
30	1	16	41	13	22	1	18	44	4	27	0	0	0	0	0	0
Sign.	11		5			10		4			9		3			Sign

S U B T R A C T.

Reduction *with the* Exceſs *above the leaſt* Inclination, 4°. 59′ 35″.

SUBTRACT.

☽ Node à ☽ in Orb.									☽ Node à ☽ in Orb.
Sign.	0	6	Exc.	1	7	Exc.	2	8	Exc.	Sign.
°	′	″	″	′	″	″	′	″	″	°
0	0	0	0	5	40	42	5	40	42	30
1	0	14	2	5	47	43	5	33	41	29
2	0	27	4	5	53	44	5	25	40	28
3	0	41	6	5	59	45	5	17	39	27
4	0	55	8	6	4	46	5	10	38	26
5	1	8	9	6	8	46	5	1	37	25
6	1	22	11	6	13	46	4	52	36	24
7	1	35	12	6	17	47	4	42	35	23
8	1	48	13	6	20	47	4	33	34	22
9	2	1	15	6	23	47	4	23	33	21
10	2	14	17	6	26	47	4	13	31	20
11	2	27	19	6	28	47	4	2	30	19
12	2	40	20	6	30	48	3	51	29	18
13	2	52	22	6	31	48	3	40	28	17
14	3	4	23	6	32	48	3	29	26	16
15	3	16	24	6	32	48	3	17	24	15
16	3	28	26	6	32	48	3	5	23	14
17	3	40	28	6	31	48	2	53	22	13
18	3	51	29	6	30	48	2	40	20	12
19	4	2	30	6	29	47	2	28	19	11
20	4	12	31	6	26	47	2	15	17	10
21	4	23	33	6	23	47	2	2	15	9
22	4	33	34	6	20	47	1	49	13	8
23	4	44	35	6	17	47	1	35	12	7
24	4	52	36	6	12	46	1	22	11	6
25	5	1	37	6	8	46	1	8	9	5
26	5	9	38	6	3	46	0	55	8	4
27	5	18	39	5	58	45	0	41	6	3
28	5	26	40	5	52	44	0	27	4	2
29	5	33	41	5	46	43	0	14	2	1
30	5	40	42	5	40	42	0	0	0	0
Sign.	11	5		10	7		9	3		Sign.

ADD.

The Simple Latitude of the Moon with the Increment to the greateſt Inclination.

☽ Node à ☽ Orb.																☽ Node à ☽ Orb.
Sign.	0 N. 6 S. } Aſc.			Increment.		1 N. 7 S. } Aſc.			Increment		2 N. 8 S. } Aſc.			Increment.		Sign
	°	′	″	′	″	°	′	″	′	″	°	′	″	′	″	
0	0	0	0	0	0	2	29	39	8	50	4	19	22	15	21	30
1	0	5	14	0	19	2	34	9	9	7	4	21	58	15	30	29
2	0	10	27	0	37	2	38	37	9	21	4	24	56	15	39	28
3	0	15	40	0	56	2	43	1	9	39	4	26	52	15	47	27
4	0	20	52	1	14	2	47	22	9	54	4	29	12	15	56	26
5	0	26	4	1	32	2	51	41	10	9	4	31	27	16	4	25
6	0	31	17	1	50	2	55	56	10	25	4	33	37	16	12	24
7	0	36	28	2	9	3	0	8	10	39	4	35	43	16	19	23
8	0	41	38	2	28	3	4	18	10	54	4	37	43	16	27	22
9	0	46	46	2	46	3	8	23	11	8	4	39	38	16	34	21
10	0	51	57	3	5	3	12	25	11	21	4	41	28	16	40	20
11	0	57	5	3	23	3	16	24	11	37	4	43	13	16	46	19
12	1	2	15	3	40	3	20	19	11	51	4	44	53	16	52	18
13	1	7	1[illegible]	3	58	3	24	11	12	4	4	46	27	16	57	17
14	1	12	23	4	16	3	27	58	12	19	4	47	57	17	3	16
15	1	17	27	4	34	3	31	42	12	31	4	49	21	17	8	15
16	1	22	29	4	52	3	35	22	12	45	4	50	39	17	13	14
17	1	27	29	5	11	3	38	58	12	58	4	51	53	17	18	13
18	1	32	28	5	28	3	42	30	13	8	4	53	1	17	22	12
19	1	37	26	5	46	3	45	5	13	21	4	54	4	17	25	11
20	1	42	21	6	4	3	49	22	13	33	4	55	1	17	29	10
21	1	47	14	6	19	3	52	42	13	47	4	55	53	17	32	9
22	1	52	6	6	38	3	55	58	13	58	4	56	39	17	35	8
23	1	56	56	6	56	3	59	9	14	8	4	57	20	17	37	7
24	2	1	43	7	10	4	2	16	14	19	4	57	56	17	39	6
25	2	6	28	7	27	4	5	18	14	30	4	58	26	17	41	5
26	2	11	11	7	44	4	8	16	14	41	4	58	21	17	43	4
27	2	15	52	8	4	4	11	9	14	54	4	59	10	17	44	3
28	2	20	30	8	19	4	13	58	15	2	4	59	24	17	44	2
29	2	25	7	8	35	4	16	42	15	11	4	59	32	17	45	1
30	2	29	39	8	50	4	19	22	15	21	4	59	35	17	45	0
Sign.	5 N. 11 S. } De.					4 N. 10 S. } De.					3 N. 9 S. } De.					Sign.

☽ *Apo.* à ☉ 1° *Ti. equ.*	Eccentricities *of the* Moon.			☽ *Apo.* à ☉ 1° *Ti. equ.*
	0 Signs 6	Signs 7	2 Signs 8	
0	66777	61754	50224	30
1	66771	61434	49838	29
2	66754	61107	49457	28
3	66724	60772	49082	27
4	66683	60429	48714	26
5	66630	60080	48354	25
6	66566	59725	48001	24
7	66489	59363	47656	23
8	66402	58995	47321	22
9	66302	58621	46995	21
10	66192	58243	46679	20
11	66070	57860	46374	19
12	65936	57472	46081	18
13	65792	57080	45800	17
14	65636	56684	45531	16
15	65469	56285	45275	15
16	65292	55884	45033	14
17	65103	55479	44805	13
18	64905	55073	44592	12
19	64695	54666	44394	11
20	64476	54257	44212	10
21	64246	53848	44046	9
22	64006	53438	43896	8
23	63757	53030	43763	7
24	63498	52622	43647	6
25	63230	52215	43548	5
26	62952	51811	43467	4
27	62665	51409	43404	3
28	62370	51010	43359	2
29	62066	50615	43332	1
30	61754	50224	43323	0
	11 Signs 5	10 Signs 4	9 Signs 3	

TABLE *of the true* Horary Motion *and* Semidiameter *of the* Sun's Horizontal Parallax *of* ☽ *at* greateſt *and* leaſt Eccentricity.

Mean Anom. ☉ & ☽		☉ true Horary Motion.		Apparent Semidia. ☉		Leaſt Ecc. 43323 ☽ H. Par.		Great Ec. 66777 ☽ H. Par.		Mean Anom. ☉ & ☽	
s	°	′	″	′	″	′	″	′	″	s	°
0	0	2	23	15	49	55	7	53	54	12	0
	6	2	23	15	49	55	8	53	55		24
	12	2	23	15	49	55	10	53	57		18
	18	2	23	15	50	55	14	54	3		12
	24	2	23	15	50	55	18	54	10		6
1	0	2	24	15	51	55	24	54	18	11	0
	6	2	24	15	51	55	31	54	29		24
	12	2	24	15	52	55	40	54	41		18
	18	2	24	15	53	55	50	54	57		12
	24	2	25	15	55	56	1	55	11		6
2	0	2	25	15	56	56	13	55	28	10	0
	6	2	26	15	57	56	26	55	47		24
	12	2	26	15	59	56	39	56	7		18
	18	2	27	16	1	56	54	56	29		12
	24	2	27	16	3	57	8	56	52		6
3	0	2	28	16	5	57	24	57	15	9	0
	6	2	28	16	6	57	39	57	39		24
	12	2	29	16	7	57	55	58	3		18
	18	2	29	16	10	58	11	58	28		12
	24	2	30	16	11	58	27	58	53		6
4	0	2	30	16	13	58	42	59	17	8	0
	6	2	31	16	14	58	56	59	40		24
	12	2	31	16	15	59	10	60	1		18
	18	2	32	16	16	59	22	60	21		12
	24	2	32	16	18	59	33	60	41		6
5	0	2	32	16	19	59	43	60	57	7	0
	6	2	33	16	20	59	52	61	11		24
	12	2	33	16	20	59	58	61	23		18
	18	2	33	16	21	60	2	61	31		12
	24	2	33	16	22	60	5	61	35		6
5	0	2	33	16	22	60	6	61	36	6	0

DECIMAL MULTIPLICATORS *for the* Proſthapheréſes *to* ☽'s Horizontal Parallaxes *out of the* Syzygys.

Sign.	0 6	1 7	2 8	Sign.
0	.000	.435	.765	30
1	.015	.447	.771	29
2	.029	.458	.777	28
3	.044	.467	.783	27
4	.058	.481	.788	26
5	.073	.493	.794	25
6	.087	.505	.8	24
7	.102	.516	.806	23
8	.116	.528	.812	22
9	.131	.54	.817	21
10	.145	.551	.823	20
11	.16	.563	.83	19
12	.174	.574	.835	18
13	.192	.586	.838	17
14	.201	.597	.841	16
15	.226	.61	.844	15
16	.244	.62	.847	14
17	.261	.632	.85	13
18	.28	.644	.852	12
19	.29	.655	.855	11
20	.3	.67	.858	10
21	.313	.678	.861	9
22	.325	.69	.864	8
23	.336	.702	.867	7
24	.348	.714	.87	6
25	.363	.722	.87	5
26	.377	.731	.87	4
27	.391	.74	.87	3
28	.406	.748	.87	2
29	.42	.757	.87	1
30	.435	.765	.87	0
Sign.	5 11	4 10	3 9	Sign.

Alt. ☉ or ☽	Paralx. ☉	Diameter ☽ Apog. Add.	Perig. Add.
″	″	″	″
0	12	0	0
3	12	2	2
6	12	3	4
9	12	5	6
12	12	6	7
15	12	8	9
18	12	9	11
21	12	10	12
24	11	11	15
27	11	12	16
30	11	14	18
33	10	15	19
36	10	16	21
39	10	18	23
42	9	19	24
45	9	20	25
48	8	21	27
51	8	22	28
54	7	23	29
57	7	23	30
60	6	24	31
63	6	25	32
66	5	26	33
69	4	26	34
72	4	27	34
75	3	27	35
78	3	27	35
81	2	28	36
84	1	28	36
87	1	28	36
90	0	29	36

duction *of* Time *from the* Conjunction *and* Oppoſition *of the* ☽ *in her* Orbit *to the* Middle *of the* Eclipſe.

☽ ☊ *à* ☽ *in her* Orbit.

0 Signs 6.

SUBTRACT.

True Horary Motion *of the* Moon *à* ☉.

27'		28'		29'		30'		31'		32'		33'		34'		35'		36'		
'	"	'	"	'	"	'	"	'	"	'	"	'	"	'	"	'	"	'	"	°
0	00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	36	0	35	0	34	0	32	0	31	0	30	0	29	0	28	0	27	0	26	29
1	13	1	11	1	8	1	6	1	3	1	2	1	0	0	57	0	55	0	53	28
1	50	1	47	1	43	1	39	1	35	1	33	1	30	1	26	1	23	1	21	27
2	27	2	22	2	17	2	12	2	7	2	3	1	59	1	54	1	51	1	48	26
3	4	2	58	2	51	2	45	2	39	2	33	2	29	2	23	2	19	2	15	25
3	40	3	33	3	24	3	17	3	10	3	3	2	58	2	51	2	47	2	41	24
4	16	4	7	3	58	3	49	3	41	3	33	3	27	3	20	3	15	3	8	23
4	52	4	41	4	30	4	21	4	12	4	3	3	55	3	48	3	41	3	35	22
5	27	5	14	5	2	4	52	4	42	4	32	4	23	4	15	4	8	4	2	21
6	1	5	47	5	33	5	22	5	11	5	0	4	50	4	42	4	33	4	28	20
6	34	6	19	6	4	5	51	5	39	5	27	5	16	5	7	4	59	4	52	19
7	5	6	49	6	34	6	19	6	6	5	53	5	42	5	32	5	23	5	16	18
7	36	7	19	7	3	6	47	6	33	6	19	6	7	5	56	5	46	5	39	17
8	7	7	48	7	31	7	14	6	59	6	44	6	31	6	19	6	9	6	1	16
8	36	8	16	7	58	7	41	7	25	7	10	6	56	6	42	6	31	6	23	15

ADD.

11 Signs 5.

☽ ☊ *à* ☽ *in her* Orbit.

Angle of the Viſible Way of the Moon with the Eclipt in Eclipſes.

☽ ☊ à ☽ in her Orbit.

0 Signs 6.

True Horary Motion of the Moon à ⊙.

	27′	28′	29′	30′	31′	32′	33′	34′	35′	36′
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
0	5 47	5 46	5 45	5 44	5 43	5 42	5 41	5 41	5 40	5 [illegible]
1	5 47	5 46	5 45	5 44	5 43	5 42	5 41	5 41	5 40	5 [illegible]
2	5 47	5 45	5 44	5 43	5 43	5 42	5 41	5 40	5 40	5 [illegible]
3	5 46	5 45	5 44	5 43	5 42	5 42	5 41	5 40	5 40	5 [illegible]
4	5 46	5 45	5 44	5 43	5 42	5 41	5 41	5 40	5 39	5 [illegible]
5	5 45	5 44	5 43	5 42	5 42	5 41	5 40	5 39	5 39	5 [illegible]
6	5 45	5 44	5 43	5 42	5 41	5 40	5 39	5 39	5 38	5 [illegible]
7	5 44	5 43	5 42	5 41	5 40	5 40	5 39	5 38	5 38	5 [illegible]
8	5 43	5 42	5 41	5 40	5 40	5 39	5 38	5 37	5 37	5 [illegible]
9	5 42	5 41	5 40	5 39	5 39	5 38	5 37	5 37	5 36	5 [illegible]
10	5 41	5 40	5 39	5 38	5 38	5 37	5 36	5 36	5 35	5 [illegible]
11	5 40	5 39	5 38	5 37	5 37	5 36	5 35	5 35	5 34	5 [illegible]
12	5 39	5 38	5 37	5 36	5 35	5 35	5 34	5 33	5 33	5 [illegible]
13	5 38	5 37	5 36	5 35	5 34	5 33	5 33	5 32	5 31	5 31
14	5 36	5 35	5 34	5 34	5 33	5 32	5 31	5 32	5 30	5 [illegible]
15	5 35	5 34	5 33	5 32	5 31	5 31	5 30	5 29	5 29	5 [illegible]

11 Signs 5.

☽ ☊ à ☽ in her Orbit.

TABLE *of the* Declination *to* each Degree *of the* ECLIPTIC.

Signs	0		6	1		7	2		8	Signs
°	°	′	″	°	′	″	°	′	″	°
0	0	0	0	11	29	33	20	11	18	30
1	0	23	54	11	50	35	20	23	49	29
2	0	47	48	12	11	26	20	36	0	28
3	1	11	42	12	32	5	20	47	48	27
4	1	35	34	12	52	31	20	59	13	26
5	1	59	25	13	12	44	21	10	15	25
6	2	23	14	13	32	45	21	20	53	24
7	2	47	1	13	52	32	21	31	7	23
8	3	10	45	14	12	05	21	40	58	22
9	3	34	26	14	31	24	21	50	24	21
10	3	58	4	15	50	28	21	59	25	20
11	4	21	38	15	9	17	22	8	2	19
12	4	45	8	15	27	51	22	16	14	18
13	5	8	34	15	46	9	22	24	0	17
14	5	31	55	16	4	11	22	31	21	16
15	5	55	11	16	21	57	22	38	16	15
16	6	18	21	16	39	26	22	44	45	14
17	6	41	25	16	56	37	22	50	49	13
18	7	4	23	17	13	31	22	56	26	12
19	7	27	15	17	30	7	23	1	36	11
20	7	50	0	17	46	25	23	6	20	10
21	8	12	36	18	2	24	23	10	38	9
22	8	35	5	18	18	3	23	14	29	8
23	8	57	26	18	33	24	23	17	52	7
24	9	19	39	18	48	25	23	20	49	6
25	9	41	43	19	3	5	23	23	19	5
26	10	3	37	19	17	26	23	25	22	4
27	10	25	21	19	31	25	23	26	57	3
28	10	46	56	19	45	3	23	28	5	2
29	10	8	20	19	58	20	23	28	46	1
30	10	29	33	20	11	16	23	29	0	0
Signs	11		5	10		4	9		3	Signs

23°. 27′. 19″. 45

1′ - 40″ 55

TABLE *of the* Right Aſcenſion *to* each Degree *of the* ECLIPTIC.

Signs	0			1			2			Signs
°	°	′	″	°	′	″	°	′	″	°
0	0	0	0	27	54	9	57	48	36	0
1	0	55	2	28	51	32	58	51	9	1
2	1	50	4	29	49	3	59	53	52	2
3	2	45	7	30	46	44	60	56	46	3
4	3	40	10	31	44	33	61	59	49	4
5	4	35	15	32	42	32	63	3	1	5
6	5	30	22	33	40	41	64	6	23	6
7	6	25	31	34	38	59	65	9	54	7
8	7	20	42	35	37	28	66	13	33	8
9	8	15	55	36	36	6	67	17	21	9
10	9	11	11	37	34	55	68	21	18	10
11	10	6	30	38	33	54	69	25	22	11
12	11	1	53	39	33	3	70	29	33	12
13	11	57	20	40	32	22	71	33	53	13
14	12	52	51	41	31	53	72	38	19	14
15	13	48	26	42	31	34	73	42	52	15
16	14	44	6	43	31	26	74	47	31	16
17	15	39	51	44	31	29	75	52	16	17
18	16	35	40	45	31	43	76	57	7	18
19	17	31	35	46	32	7	78	2	3	19
20	18	27	36	47	32	43	79	7	3	20
21	19	23	44	48	33	30	80	12	8	21
22	20	19	58	49	34	28	81	17	17	22
23	21	16	18	50	35	36	82	22	30	23
24	22	12	46	51	36	55	83	27	45	24
25	23	9	20	52	38	25	84	33	4	25
26	24	6	2	53	40	6	85	38	24	26
27	25	2	52	54	41	58	86	43	46	27
28	25	59	49	55	44	0	87	49	10	28
29	26	56	55	56	46	13	88	54	35	29
30	27	64	9	57	48	36	90	0	0	30

When the Signs exceed 6 Subtract 6 therefrom, and to the Right Aſcenſion of the Remainder add 180 Deg.

TABLE *of the* Right Aſcenſion *to* each Degree *of the* ECLIPTIC.

Signs	3			4			5			Signs
°	°	′	″	°	′	″	°	′	″	°
0	90	0	0	122	11	24	152	5	51	0
1	91	5	25	123	13	47	153	3	5	1
2	92	10	50	124	16	0	154	0	11	2
3	93	16	14	125	18	2	154	57	8	3
4	94	21	36	126	19	54	155	53	58	4
5	95	26	56	127	21	35	156	50	40	5
6	96	32	15	128	23	5	157	47	14	6
7	97	37	30	129	24	24	158	43	42	7
8	98	42	43	130	25	32	159	40	2	8
9	99	47	52	131	26	30	160	36	16	9
10	100	52	57	132	27	17	161	32	24	10
11	101	57	57	133	27	53	162	28	25	11
12	103	2	53	134	28	17	163	24	20	12
13	104	7	44	135	28	31	164	20	9	13
14	105	12	29	136	28	34	165	15	54	14
15	106	17	28	137	28	25	166	11	34	15
16	107	21	21	138	28	7	167	7	9	16
17	108	26	7	139	27	38	168	2	40	17
18	109	30	27	140	26	57	168	58	7	18
19	110	34	38	141	26	6	169	53	30	19
20	111	38	42	142	25	5	170	48	49	20
21	112	42	39	143	23	54	171	44	5	21
22	113	46	27	144	22	32	172	39	18	22
23	114	50	6	145	21	1	173	34	29	23
24	115	53	37	146	19	19	174	29	38	24
25	116	56	59	147	17	28	175	24	45	25
26	118	0	11	148	15	27	176	19	50	26
27	119	3	14	149	13	16	177	14	53	27
28	120	6	8	150	10	57	178	9	56	28
29	121	8	51	151	8	28	179	4	58	29
30	122	11	24	152	5	51	180	0	0	30

When the Signs exceed 6 ſubtract 6 therefrom, and to the Right Aſcenſion of the Remainder add 180 Deg.

TABLE of Right Aſcenſion in Time to every Degree of the ECLIPTIC.

Signs	0			1			2		
°	Ho.	Min.	Se.	Ho.	Min.	Se.	Ho.	Min.	Se.
0	0	0	0	1	51	37	3	51	14
1	0	3	40	1	55	26	3	55	25
2	0	7	20	1	59	16	3	59	36
3	0	11	0	2	3	7	4	3	47
4	0	14	41	2	6	58	4	7	59
5	0	18	21	2	10	50	4	12	12
6	0	22	1	2	14	43	4	16	26
7	0	25	42	2	18	36	4	20	40
8	0	29	23	2	22	30	4	24	54
9	0	33	4	2	26	25	4	29	10
10	0	36	45	2	30	20	4	33	25
11	0	40	26	2	34	16	4	37	42
12	0	44	8	2	38	12	4	41	58
13	0	47	50	2	42	10	4	46	16
14	0	51	32	2	46	8	4	50	33
15	0	55	14	2	50	6	4	54	52
16	0	58	56	2	54	6	4	59	10
17	1	2	40	2	58	6	5	3	29
18	1	6	23	3	2	7	5	7	49
19	1	10	7	3	6	9	5	12	8
20	1	13	51	3	10	11	5	16	28
21	1	17	35	3	14	14	5	20	49
22	1	21	20	3	18	18	5	25	9
23	1	25	5	3	22	22	5	29	30
24	1	28	51	3	26	29	5	33	51
25	1	32	37	3	30	34	5	38	12
26	1	36	24	3	34	40	5	42	34
27	1	40	12	3	38	48	5	46	55
28	1	43	59	3	42	56	5	51	17
29	1	47	48	3	47	5	5	55	38
30	1	51	37	3	51	14	6	0	0

When the Signs exceed 6 ſubtract 6 therefrom, and to the Right Aſcenſion of the Remainder add 12 Hours.

TABLE *of* Right Aſcenſion *in* Time *to* each Degree *of the* ECLIPTIC.

Signs	3			4			5			Signs
0	Ho.	Min.	Se.	Ho.	Min.	Se.	Ho.	Min.	Se.	0
0	6	0	0	8	8	45	10	8	23	0
1	6	4	22	8	12	55	10	12	12	1
2	6	8	43	8	17	4	10	16	1	2
3	6	13	5	8	21	12	10	19	49	3
4	6	17	26	8	25	20	10	23	36	4
5	6	21	48	8	29	26	10	27	33	5
6	6	26	9	8	33	32	10	31	19	6
7	6	30	30	8	37	38	10	34	55	7
8	6	34	51	8	41	42	10	38	40	8
9	6	39	11	8	45	46	10	42	25	9
10	6	43	32	8	49	49	10	46	10	10
11	6	47	52	8	53	52	10	49	54	11
12	6	52	11	8	57	53	10	53	37	12
13	6	56	31	9	1	54	10	57	21	13
14	7	0	50	9	5	54	11	1	4	14
15	7	5	8	9	9	54	11	4	46	15
16	7	9	26	9	13	52	11	8	29	16
17	7	13	44	9	17	50	11	12	11	17
18	7	18	2	9	21	48	11	15	52	18
19	7	22	18	9	25	44	11	19	34	19
20	7	26	35	9	29	40	11	23	15	20
21	7	30	50	9	33	36	11	26	56	21
22	7	35	6	9	37	30	11	30	37	22
23	7	39	20	9	41	24	11	34	18	23
24	7	43	34	9	45	17	11	37	58	24
25	7	47	48	9	49	10	11	41	39	25
26	7	52	1	9	53	2	11	45	19	26
27	7	56	13	9	56	53	11	49	0	27
28	8	0	24	10	0	44	11	52	40	28
29	8	4	35	10	4	34	11	56	20	29
30	8	8	45	10	8	23	12	0	0	30

When the Signs exceed 6 ſubtract 6 therefrom, and to the Right Aſcenſion of the Remainder add 12 Hours.

O o

Equation *to be applied to the* Right Aſcenſions *of the* Ecliptic *for* Points *of the* Zodiac, *having* Latitude.

Lat. North in ♈ ♉ ♊ } Subtract
Lat. Sọuth in ♎ ♏ ♐ }

Longitude.		1		3		5		7		9		Longitude	
		°	′	°	′	°	′	°	′	°	′		
♈	♎	0	23	1	11	1	59	2	47	3	37	30	
	3	0	23	1	11	1	59	2	47	3	37	27	
	6	0	23	1	11	1	59	2	47	3	36	24	
	9	0	23	1	11	1	58	2	48	3	36	21	
	12	0	23	1	10	1	58	2	48	3	35	18	
	15	0	23	1	10	1	57	2	46	3	34	15	
	18	0	23	1	9	1	55	2	44	3	32	12	
	21	0	23	1	9	1	53	2	42	3	30	9	
	24	0	22	1	8	1	51	2	40	3	28	6	
	27	0	22	1	6	1	50	2	37	3	25	3	
♉	♏	0	21	1	5	1	49	2	35	3	22	♍	♓
	3	0	21	1	3	1	47	2	31	3	18	27	
	6	0	20	1	2	1	44	2	28	3	13	24	
	9	0	20	1	1	1	42	2	24	3	9	21	
	12	0	19	0	58	1	38	2	19	3	3	18	
	15	0	18	0	55	1	33	2	13	2	55	15	
	18	0	17	0	53	1	30	2	8	2	48	12	
	21	0	17	0	51	1	26	2	2	2	39	9	
	24	0	16	0	48	1	21	1	55	2	29	6	
	27	0	15	0	45	1	16	1	48	2	20	3	
♊	♐	0	14	0	41	1	10	1	40	2	10	♌	♒
	3	0	13	0	39	1	5	1	31	1	59	27	
	6	0	11	0	34	0	58	1	22	1	48	24	
	9	0	10	0	30	0	52	1	14	1	36	21	
	12	0	8	0	26	0	44	1	3	1	24	18	
	15	0	7	0	22	0	38	0	54	1	11	15	
	18	0	6	0	18	0	30	0	43	0	58	12	
	21	0	4	0	13	0	23	0	33	0	44	9	
	24	0	3	0	9	0	15	0	23	0	31	6	
	27	0	1	0	4	0	7	0	11	0	16	3	
	30	0	0	0	0	0	0	0	0	0	0	♋	♑
		1		3		5		7		9			

Lat. North in ♑ ♒ ♓ } Add
Lat. South in ♋ ♌ ♍ }

Equation *to be applied to the* Right Aſcenſions *of the* Ecliptic *for* Points *of the* Zodiac, *having* Latitude.

Longitude.	Lat. South in ♈ ♉ ♊ Lat. North in ♎ ♏ ♐ } Add										Longitude.
	1		3		5		7		9		
	°	′	°	′	°	′	°	′	°	′	
♈ ♎	0	24	1	11	1	59	2	47	3	36	30
3	0	23	1	11	1	59	2	47	3	35	27
6	0	23	1	11	1	59	2	47	3	34	24
9	0	23	1	11	1	58	2	46	3	32	21
12	0	23	1	11	1	58	2	45	3	30	18
15	0	23	1	10	1	57	2	43	3	28	15
18	0	23	1	9	1	55	2	41	3	26	12
21	0	22	1	9	1	53	2	39	3	23	9
24	0	22	1	8	1	52	2	36	3	20	6
27	0	22	1	6	1	50	2	33	3	15	3
♉ ♏	0	22	1	4	1	47	2	28	3	10	♍ ♓
3	0	21	1	3	1	44	2	25	3	5	27
6	0	20	1	2	1	42	2	21	2	59	24
9	0	19	0	59	1	38	2	15	2	54	21
12	0	19	0	57	1	34	2	10	2	45	18
15	0	19	0	55	1	31	2	6	2	39	15
18	0	18	0	52	1	27	2	0	2	31	12
21	0	17	0	49	1	21	1	54	2	22	9
24	0	16	0	47	1	17	1	47	2	13	6
27	0	15	0	44	1	12	1	39	2	4	3
♊ ♐	0	14	0	41	1	7	1	32	1	55	♌ ♒
3	0	12	0	37	0	58	1	25	1	45	27
6	0	11	0	33	0	49	1	16	1	34	24
9	0	10	0	30	0	42	1	8	1	23	21
12	0	9	0	26	0	35	0	58	1	12	18
15	0	7	0	21	0	31	0	49	1	0	15
18	0	6	0	17	0	22	0	40	0	49	12
21	0	5	0	13	0	15	0	30	0	37	9
24	0	3	0	9	0	9	0	20	0	24	6
27	0	1	0	4	0	4	0	10	0	13	3
30	0	0	0	0	0	0	0	0	0	0	♋ ♑
	1		3		5		7		9		
	Lat. North in ♑ ♒ ♓ Lat. South in ♋ ♌ ♍ } Subtract										

Equation *to be ſubtracted from the* Latitude *of a* Planet, *which gives the* Difference *betwixt its* Declination *and the* Declination *of its* Point *in the* Ecliptic.

Degrees *of* Latitude.

Longitude.	1	2	3	4	5	6	Longitude.
°	′	′	′	′	′	′	°
♈ 0	5	10	15	20	25	30	30
3	5	10	15	20	25	30	27
6	5	10	15	20	25	30	24
9	5	10	15	20	25	29	21
12	5	10	15	19	24	29	18
15	5	10	14	19	24	28	15
18	5	9	14	18	23	27	12
21	4	9	14	18	22	26	9
24	4	8	13	17	21	25	6
27	4	8	13	17	20	24	3
♉ 0	4	8	12	16	19	23	♍
3	4	8	11	15	18	22	27
6	4	7	10	14	17	21	24
9	3	6	9	13	16	20	21
12	3	6	9	12	15	18	18
15	3	6	8	11	14	17	15
18	3	5	7	10	13	16	12
21	3	5	6	9	12	14	9
24	2	4	6	8	10	13	6
27	2	4	5	7	9	11	3
♊ 0	2	3	4	6	7	9	♌
3	2	2	3	5	6	8	27
6	2	2	3	4	5	6	24
9	1	2	2	3	4	5	21
12	1	1	2	2	3	4	18
15	1	1	1	1	2	3	15
18	1	1	1	1	1	2	12
21	0	0	0	0	0	1	9
24	0	0	0	0	0	0	6
27	0	0	0	0	0	0	3
30	0	0	0	0	0	0	♋

ROTATION of the EARTH.

ime.	°			Time.				Time.			
No.	°	'	"	Sec. Min.	' °	" '	''' "	Sec. Min.	' °	" '	''' "
1	15	2	28	1	0	15	2	31	7	46	16
2	30	4	56	2	0	30	5	32	8	1	18
3	45	7	24	3	0	45	7	33	8	16	21
4	60	9	51	4	1	0	10	34	8	31	24
5	75	12	19	5	1	15	12	35	8	46	26
6	90	14	47	6	1	30	15	36	9	1	28
7	105	17	15	7	1	45	17	37	9	16	31
8	120	19	43	8	2	0	20	38	9	31	34
9	135	22	11	9	2	15	22	39	9	46	36
10	150	24	38	10	2	30	25	40	10	1	38
1	165	27	6	11	2	45	27	41	10	16	41
2	180	29	34	12	3	0	30	42	10	31	44
3	195	32	2	13	3	15	32	43	10	46	46
4	210	34	30	14	3	30	35	44	11	1	48
5	225	36	57	15	3	45	37	45	11	16	51
6	240	39	25	16	4	0	39	46	11	31	54
7	255	41	53	17	4	15	42	47	11	46	56
8	270	44	21	18	4	30	44	48	12	1	58
9	285	46	49	19	4	45	47	49	12	17	1
0	300	49	17	20	5	0	49	50	12	32	4
1	315	51	44	21	5	15	52	51	12	47	6
2	330	54	12	22	5	30	54	52	13	2	8
3	345	56	40	23	5	45	57	53	13	17	11
4	360	59	8	24	6	0	59	54	13	32	14
				25	6	16	2	55	13	47	16
				26	6	31	4	56	14	2	18
One Revolution.				27	6	46	7	57	14	17	20
h.	'	"	'''	28	7	1	9	58	14	32	22
23	56	4	6	29	7	16	11	59	14	47	25
				30	7	31	14	60	15	2	28

Declination of the Moon.	Equation *to be added to the* Horizontal Diameter ☽.									
	Horiz: Diam. 29′ 30″		30′ 0″		30′ 30″		31′ 0″		31′ 30″	
Gr.	′	″	′	″	′	″	′	″	′	″
1	+		+		+		+		+	
2	0	1	0	1	0	1	0	1	0	1
3	0	2	0	2	0	2	0	2	0	2
4	0	4	0	4	0	4	0	4	0	4
5	0	7	0	7	0	7	0	7	0	7
6	0	10	0	10	0	10	0	10	0	10
7	0	13	0	13	0	13	0	14	0	14
8	0	17	0	17	0	17	0	18	0	18
9	0	22	0	22	0	22	0	23	0	23
10	0	27	0	27	0	28	0	28	0	29
11	0	33	0	33	0	34	0	34	0	35
12	0	40	0	40	0	41	0	42	0	42
13	0	47	0	47	0	48	0	49	0	50
14	0	54	0	55	0	56	0	57	0	58
15	1	2	1	3	1	4	1	5	1	7
16	1	11	1	12	1	13	1	14	1	16
17	1	21	1	22	1	23	1	24	1	26
18	1	31	1	32	1	34	1	35	1	37
19	1	42	1	43	1	45	1	47	1	49
20	1	54	1	55	1	57	1	59	2	1
21	2	6	2	8	2	10	2	12	2	14
22	2	19	2	21	2	24	2	26	2	28
23	2	33	2	35	2	38	2	41	2	43
24	2	47	2	50	2	53	2	56	2	59
25	3	2	3	5	3	9	3	12	3	15
26	3	18	3	22	3	25	3	29	3	32
27	3	36	3	40	3	43	3	47	3	51
28	3	55	3	59	4	3	4	7	4	11
29	4	14	4	19	4	23	4	27	4	31
30	4	34	4	39	4	43	4	48	4	52

Declination of the Moon.	Equation to be added to the Horizontal Diameter ☽.									
	Horiz. Diam. 32′ 0″		32′ 30″		33′ 0″		33′ 30″		34′ 0″	
Gr.	′	″	′	″	′	″	′	″	′	″
1	+		+		+		+		+	
2	0	1	0	1	0	1	0	1	0	1
3	0	3	0	3	0	3	0	3	0	3
4	0	5	0	5	0	5	0	5	0	5
5	0	7	0	7	0	7	0	7	0	7
6	0	11	0	11	0	11	0	11	0	11
7	0	14	0	15	0	15	0	15	0	15
8	0	18	0	19	0	19	0	20	0	20
9	0	23	0	24	0	24	0	25	0	25
10	0	29	0	30	0	30	0	31	0	31
11	0	36	0	37	0	37	0	38	0	38
12	0	43	0	44	0	44	0	45	0	46
13	0	51	0	52	0	52	0	53	0	54
14	0	59	1	0	1	1	1	2	1	3
15	1	8	1	9	1	10	1	11	1	12
16	1	17	1	19	1	20	1	21	1	22
17	1	27	1	29	1	31	1	32	1	33
18	1	38	1	40	1	42	1	43	1	45
19	1	50	1	52	1	54	1	56	1	58
20	2	3	2	5	2	7	2	9	2	11
21	2	17	2	19	2	21	2	23	2	25
22	2	31	2	33	2	35	2	38	2	40
23	2	46	2	48	2	51	2	54	2	56
24	3	1	3	4	3	7	3	10	3	13
25	3	18	3	21	3	25	3	28	3	31
26	3	36	3	40	3	44	3	47	3	50
27	3	55	3	59	4	3	4	6	4	10
28	4	15	4	19	4	23	4	27	4	31
29	4	36	4	40	4	44	4	49	4	53
30	4	57	5	1	5	6	5	11	5	16

DECIMAL TABLE *for* Minutes *of a* Degree.				DECIMAL TABLE *for* Seconds *of a* Degree.			
′	Dec.	′	Dec.	″	Dec.	″	Dec.
1	.016	31	.516	1	.00027	31	.00861
2	.03	32	.53	2	.0005	32	.008
3	.05	33	.55	3	.00083	33	.00916
4	.06	34	.56	4	.001	34	.0094
5	.083	35	.583	5	.00138	35	.00972
6	.1	36	.6	6	.0016	36	.01
7	.116	37	.616	7	.00194	37	.01027
8	.13	38	.63	8	.002	38	.0105
9	.15	39	.65	9	.0025	39	.01083
10	.16	40	.6	10	.0027	40	.01
11	.183	41	.683	11	.00305	41	.01138
12	.2	42	.7	12	.003	42	.0116
13	.216	43	.716	13	.00361	43	.01194
14	.23	44	.73	14	.0038	44	.012
15	.25	45	.75	15	.00416	45	.0125
16	.26	46	.76	16	.004	46	.0127
17	.283	47	.783	17	.00472	47	.01305
18	.3	48	.8	18	.005	48	.013
19	.316	49	.816	19	.00527	49	.01361
20	.3	50	.83	20	.005	50	.0138
21	.35	51	.85	21	.00583	51	.01416
22	.56	52	.86	22	.0061	52	.014
23	.383	53	.883	23	.00638	53	.01472
24	.4	54	.9	24	.006	54	.015
25	.416	55	.916	25	.00694	55	.01527
26	.43	56	.93	26	.0072	56	.015
27	.45	57	.95	27	.0075	57	.01583
28	.46	58	.96	28	.007	58	.0161
29	.483	59	.983	29	.00805	59	.01638
30	.5	60	1.000	30	.0083	60	.016

TABLE *of the* Meridian Angle, *or* Angle *of the* Points *of the* Ecliptic *with the* Meridian.

	♈			♉			♊			
	°	′	″	°	′	″	°	′	″	
0	66	31	0	69	22	50	77	44	38	30
1	66	31	12	69	34	27	78	6	20	29
2	66	31	46	69	45	26	78	28	17	28
3	66	32	44	69	58	46	78	50	31	27
4	66	34	3	70	11	30	79	13	1	26
5	66	35	47	70	24	25	79	35	45	25
6	66	37	54	70	38	1	79	58	43	24
7	66	40	23	70	51	51	80	21	54	23
8	66	43	16	71	6	3	80	45	20	22
9	66	46	30	71	20	36	81	9	1	21
10	66	50	8	71	35	30	81	32	53	20
11	66	54	8	71	50	45	81	56	57	19
12	66	58	34	72	6	23	82	21	13	18
13	67	3	20	72	22	20	82	45	38	17
14	67	8	30	72	38	40	83	10	15	16
15	67	14	2	72	55	21	83	35	3	15
16	67	19	58	73	12	22	84	0	0	14
17	67	26	15	73	29	43	84	25	5	13
18	67	32	56	73	47	25	84	50	18	12
19	67	40	2	74	5	26	85	15	40	11
20	67	47	30	74	23	46	85	41	8	10
21	67	55	20	74	42	28	86	6	43	9
22	68	3	33	75	1	30	86	32	24	8
23	68	12	7	75	20	50	86	58	9	7
24	68	21	6	75	40	27	87	23	59	6
25	68	30	28	76	0	25	87	49	54	5
26	68	40	10	76	20	41	88	15	51	4
27	68	50	16	76	41	13	88	41	50	3
28	69	0	47	77	2	5	89	7	52	2
29	69	11	37	77	23	13	89	33	55	1
30	69	22	50	77	44	38	90	0	0	0
	♓			♒			♑			

TABLE *of the* Meridian Angle, *or* Angle *of the* Points *of the* Ecliptic *with the* Meridian.

	♋			♌			♍			
	°	′	″	°	′	″	°	′	″	
0	90	0	0	102	15	22	110	37	10	30
1	90	26	5	102	36	47	110	48	23	29
2	90	52	8	102	57	55	110	59	13	28
3	91	18	10	103	18	47	111	9	44	27
4	91	44	9	103	39	19	111	19	50	26
5	92	10	6	103	59	35	111	29	32	25
6	92	36	1	104	19	33	111	38	54	24
7	93	1	51	104	39	10	111	47	53	23
8	93	27	36	104	58	30	111	56	27	22
9	93	53	17	105	17	32	112	4	40	21
10	94	18	52	105	36	14	112	12	30	20
11	94	44	20	105	54	34	112	19	58	19
12	95	9	42	106	12	35	112	27	4	18
13	95	34	55	106	30	17	112	33	45	17
14	96	0	0	106	47	38	112	40	2	16
15	96	24	57	107	4	39	112	45	58	15
16	96	49	45	107	21	20	112	51	30	14
17	97	14	22	107	37	40	112	56	40	13
18	97	38	47	107	53	37	113	1	26	12
19	98	3	3	108	9	15	113	5	52	11
20	98	27	7	108	24	30	113	9	52	10
21	98	50	59	108	39	24	113	13	30	9
22	99	14	40	108	53	57	113	16	44	8
23	99	38	6	109	8	9	113	19	37	7
24	100	1	17	109	21	59	113	22	6	6
25	100	24	15	109	35	25	113	24	13	5
26	100	46	59	109	48	30	113	25	57	4
27	101	9	29	110	1	14	113	27	16	3
28	101	31	43	110	13	34	113	28	14	2
29	101	53	40	110	25	33	113	28	48	1
30	102	15	22	110	37	10	113	29	0	0
	♐			♏			♎			

To diſcover the Number of Eclipſes and Time of their happening, in any Year req

Firſt, FIND the Place of the Node the Firſt of *January* for the Year, to which adding ſix Signs, gives Place of the other Node, they being al oppoſite to each other.

Secondly, Obſerve what Months the S ters thoſe Signs, wherein the Nodes are, w is immediately diſcovered by the Figure Beginning of the Book.

Thirdly, Find the Place of the Sun on Firſt Day of each of the ſaid Months.

Then, with the Proſthaphereſis for red the Moon's Mean Place on each reſpective in the Year 1736 to that for the Year req if the ſame be additive (as it will always be Years forward) ſubtract it from the afor Places of the Sun, and ſeek the Remaind next leſs, among the Moon's Mean Plac the ſaid Months of the Year 1736, addi many Degrees to the ſaid Remainder as Number of Days from the Firſt of the Month excluſive. The Day anſwering laſt Sum is that whereon the Change Moon happens, and the Difference by this laſt Sum exceeds the Numbers agai ſaid Day, being multiplied by 2, give Time of the Day according to the Mea tions.

If the aforeſaid Proſthaphereſis be ablative, s it may be for Time paſt) it muſt then be ldded to the Place of the Sun, operating in l other reſpects as before.

If the Change of the Moon, thus found, ıppens within * 18 Deg. either before or af- r the Node, there will be an Eclipſe of the ın, otherwiſe not.

* This tho' not at all Times the exact Limit, yet it may be taken as ſuch for Eſtimation.

If from the aforeſaid laſt Sum be alſo ſub- acted 1 Sign, it will give the Numbers for ſcovering in like manner the Day of the pre- ding Change; and if to the ſame there be ldded 1 Sign, it will give thoſe for diſcovering e Day of the ſubſequent, when, by the afore- id Circumſtances, may be found if there will an Eclipſe, or not.

Laſtly, If from the Numbers for thus diſ- vering the Change, you ſubtract 6^{s} 15° you ill have the Numbers for diſcovering the Day the preceding; and by adding 6^{s} 15° thoſe r diſcovering the Day of the ſubſequent Op- ſition of the Moon.

Which, if ſhould happen within * 12° ei- er before or after the Node, there will be an clipſe of the Moon, otherwiſe not.

* As above.

N.B. If the Month be *January* or *February*, ıd it be not Leap-Year, the Day thus found ill be a Day leſs, *viz.* 29 the 28th, &c.

Having thus diſcovered the Mean Time of an Eclipſe, proceed to find out the Places of the Moon's Mean Longitude, Apogé, &c. by which means you may ever (in ſuch Caſes) eſtimate near enough the Elliptic Equation, which apply to the aforeſound Mean Place of the Moon at the eſtimated Time of the Conjunction or Oppoſition; next ſee how far this laſt Place is ſhort or beyond the ſaid Conjunction or Oppoſition, which Diſtance, being multiplied by 2, gives the Hour, &c. to be added to the ſaid eſtimated Time; in the firſt Caſe and ſubtracted, in the latter, which will always to a few Minutes give the true Time, to which if you now calculate as if it was the True, the Exceſs or Defect will be eaſily obtained by the Hourly Motion of the Moon from the Sun, which will be explained in the following Examples.

Firſt, Let the Number of the Eclipſes for the Year 1739 be required.

The * Mean Place of the Node to Degrees, which at preſent is ſufficient, will be found to be $4^{s}\ 13^{\circ}$, to which adding 6 Signs, gives $10^{s}\ 13^{\circ}$, *viz.* ♌ and ♒, which Signs the Sun is found to enter in the Months of *January* and *July*.

* Which in Eclipſes is ever within a Degree of the True, and may be found, if Occaſion.

The true Place of the Sun on the Firſt of *January* to Min. is $9^{s}\ 20^{\circ}\ 55'$, which in this Caſe may be taken $9^{s}\ 21^{\circ}$. The Proſthapheresis for the Reduction of the Moon's Places 1736 to 1739, is $0^{s}\ 28^{\circ}$ additive, (alſo near

enough

ough for the preſent Purpoſe) which, being
tracted from the aforeſaid Place of the Sun
21°, gives 8^{s} 23°, againſt which, among
e Mean Places of the Moon in the ſaid
onth, anſwers 27th Day (*ferè*) to the ſaid
23°; now adding 26° for the Number of
ays, excluſive from the Firſt of the Month,
ves 9^{s} 19° which, ſeeking again in the Ta-
e, againſt *January* 28. (which, as being not
eap-Year, is 27.) you have 9^{s} 8°, and there
ing an Increaſe of a Day, a Degree more
uſt be added to 9^{s} 19°, which gives 9^{s} 20°,
e Difference 12°, being multiplied by 2,
ves 24 Hours, *viz.* the Noon of the next Day,
r the Mean Time of the Change, which is
ithin 7 Hours of the True, at which Time
e Mean Place of the Node, anſwering to the
id Day of the Month, is 10^{s} 11°; next, ad-
ng 27°, *viz.* 1 Degree *per Diem*, to the a-
reſaid Place of the Sun on the 1° of the
onth, *viz.* 9^{s} 21°, gives 10^{s} 18°, which
within 7° of the ſaid Node, and conſequent-
there will then be an Eclipſe of the Sun.

Again, If from this laſt Sum, *viz.* 9^{s} 20°
ou ſubtract 6^{s} 15°, and ſeek the Remainder,
z. 3^{s} 5°, among the Mean Places of the
oon; alſo in the ſaid Month on the 14th
ay (which is here to be 13°) you have 3
°, the Difference 2, being multiplied by 2,
ves 4 Hours after Noon for the preceding
ppoſition, and is alſo within 7 Hours of the
rue; next, adding 13°, the Number of Days
om the Firſt of the Month excluſive, to the
oreſaid Place of the Sun on the Firſt of the
onth; *viz.* 9^{s} 21°, gives 10^{s} 4°, at which
Time

Time alſo the Mean Place of the Node wi found to be $10^{s}\ 12^{\circ}$, the Difference 8°, ing within the Limits, *viz.* 12°, ſhews will alſo be an Eclipſe of the Moon at the Oppoſition.

The like Method is to be uſed with the ceding and ſubſequent Change and Oppoſi if found requiſite.

Proceeding in the ſame Manner for Month of *July*, the true Place of the Sun be found to be $3^{s}\ 19^{\circ}\ 32'$, or $3^{s}\ 20^{\circ}$, which ſubtracting $0^{s}\ 28^{\circ}$ as before, gives 22° the neareſt Number, to which among Moon's Mean Places in the ſaid Month ſwers 22d Day, and then 21° for 21 D from the Firſt of the ſaid Month, being to the ſaid $2^{s}\ 22^{\circ}$, gives $3^{s}\ 13^{\circ}$, whic by which it exceeds the ſaid Number ag 24th Day, being multiplied by 2, gi Hours after Noon for the Time of the Cha and is directly the Time.

Again, 23° for the Days from the Firſt the Month, being added to the Sun's Plac the ſaid Firſt of the Month, *viz.* $3^{s}\ 20^{\circ}$, g $4^{s}\ 13^{\circ}$ *ferè*, and the Mean Place of the N will be found to be $4^{s}\ 2^{\circ}$, the Difference being within the Limits there, will conſeq ly be an Eclipſe of the Sun.

Laſtly, If from this laſt Sum, *viz.* 3^{s} 1 there be ſubtracted $6^{s}\ 15^{\circ}$, and the Rem der 9^{s} ſought out among the Moon's M Places, the Oppoſition will be found to be

e 9th Day, at 8 at Night, Mean Time (which
about 4 Hours from the True) the Place of
e Sun 3ˢ 28° *ferè*, and the Mean Place of
e Node 4ˢ 3°, which being but 5° diſtant,
d therefore within the Limits, there conſe-
ently will be an Eclipſe of the Moon; and
as the whole Number of Eclipſes will be
und to be * Five for the ſaid Year 1739;
d in like manner may the Number of Eclipſes
determined for any Year required.

Having thus given a general Method for
ding the Mean Time of an Eclipſe, as alſo
eir Number for any Year required, I ſhall
xt ſhew how to obtain the true Time.

In Eclipſes of the Sun that are viſible, it will
beſt to begin the Calculus at the Noon of the
ay whereon the Eclipſe happens, and of the
oon at 12 Ho. P.M. of the ſaid Day.

Example.

Let it be required to obtain the true Time of
e Oppoſition of the Sun and Moon in her
rb *March* 15. 1736. on which Day, by the
oreſaid Rules, there may be found to have
ppened an Eclipſe of the Moon. The Mean
aces of the Moon, *&c.* will be found as fol-
w, making uſe of but three Equations as in
age 164. but if you compute according to the
heory, you muſt then apply the other Equa-
ons, as by the Precepts before given, 'till you
me to the Elliptic, when proceed as in this
xample.

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* It will be convenient ſometimes to obſerve by the Place of either of
Nodes at the Beginning of the enſuing Year, if there will be any
pſe at the latter End of the preceding, as in the preſent Year, which
be eaſily ſeen by the foregoing Rules.

1736, Equal Time *Mar.* 15. 12h. P. M. — True Place ☉. 0s 26° 36′ 20″ — Me. Anom. ☉ 8s 26° 26′ 21″ — 1736, Equal Time, *Mar.* 15. 12h. P. M.

☽ Me. Long.					Apogé.					☽ Node.				
	s	°	′	″	s	°	′	″		s	°	′	″	
	6	3	59	45	11	0	52	35		6	6	31	4	
Ann. Equs.		—	12	5		+	21	56			—	8	55	
	6	3	47	40	11	1	14	31		6	6	22	9	
Ho. Paralx.			60	51	1	5	21	49	Ap. à ☉.	6	0	14	11	☋ à ☉
Ho. ½ Diar.			16	52	+	10	38	54	2d. Equ. Ap.			+	11	2d. Equat. ☊.
					11	11	53	25	Tr. Pl. Apo.	6	6	22	20	Tr. Pl. ☊.
					6	21	54	15	☽ Me. Ano.			14	0	☊ à Orbit.
												1	32	Lat, Nor. Aſc.

With the Mean Anomaly, *viz.* 6^{s} 22° in s Caſe, entering the Table of the Mean El- tic Equation, you have 2° 29′ 24″, next th the Degrees of the Diſtance, ☽ Apogé à ☉ hich in this Caſe may be alſo taken in round umbers) and the Complement of the Mean nomaly, as it exceeds ſix Signs, entering the ıble of Reduction, *&c.* you will have about 16′ be added to the aforeſaid 2° 29′ 24″, *i. e.* 45′ 24″ *ferè* for the true Elliptic Equa- ɔn to be added to the aforeſaid Place of the oon firſt Equated, which gives 6^{s} 6° 33′ 4″ out 3′ ſhort of the Oppoſition ☉, whence e aforeſaid Time proves very near the True, which Time, now calculating again, as if it as the True, the Difference will be eaſily und by the Hourly Motion of the Moon om the Sun.

In this Example, the true Place of the Moon her Orb will be found to be 6^{s} 6° 32′ 55″ ıat of the Sun, as before, 0^{s} 6° 36′ 20″, the iſtance of the Moon ſhort of the Oppoſition 25″, the horary Motion of the Sun taken ut of the Table (*Page* 272.) is 2′ 28″, the orary Motion of the Moon in her Orb, her lace being calculated for an Hour forwarder, ill be found to be 37′ 14″, the Difference of ıeſe horary Motions is that of the Moon from he Sun, *viz.* 34′ 46″; the Proportion then or finding the Time of the true Orbit Oppo- ition is, as 34′ 46″ is to 60′, or an Hour, o is 3′ 25″, the Diſtance of the Moon from he ſaid Orbit Oppoſition, to 5′ 54″, the Time as the Moon was ſhort of the Oppoſition) to be added to the Eſtimated Time, as above, Midnight, or 12 Ho. P. M. and thus the Orbit Oppoſition is found to be 12 ho. 5′ P. M. Equal Time.

If you would know the Places of the Lu naries at the ſaid Time, it will be as an H (or 60′) is to 37′ 14″, the Space deſcribed the Moon in an Hour, ſo is 5′ 54″ to 3′ which added to her Place, when ſhort as be of the Oppoſition, *viz.* 6, 6° 36′ 34″, her Place, that of the * Sun being the direct O poſite.

* If to this laſt Time, *viz.* 12 ho. 5 m. 54 ſec. the Places of the Luminaries be again calculated, they will be found directly oppoſite.

For a further Proof of this, if the Sun an Hour, or 60′, moves 2′ 28″, what will move in 5′ 54″, Anſwer 14″; which add to the aforeſaid Place of the Sun, makes it ſame with that of the Moon, as laſt found, d ducting 6^s for the Oppoſition.

If the Calculus of the Moon's Place for Hour forward or backward may at any Ti be thought irkſome, it may be obtained w great accuracy in the Zyzygys by the follow Method.

Firſt, It is to obſerved, that the M Hourly Motion of the Moon at a Mean D tance and Mean Eccentricity, (at which Ti the Mean Horizontal Parallax takes place, 57′ 30″,) is ever 33′ 33″.

Next, take the Difference between the p ſent Horizontal Parallax and the Mean, wh being multiplied by the conſtant Factor 1.1

d the Product added to, or ſubtracted from,
e ſaid Mean Hourly Motion, according as
e preſent Horizontal Parallax is greater or
ſer than the Mean, will give the preſent
ourly Motion required.

In this Example the Horizontal Parallax is
′ 51″ greater than the Mean by 3′ 21″,
hich multiplied by the aforeſaid Conſtant
ctor 1.12, gives 3′ 43″ to be added to the
lean hourly Motion 33′ 33″, which gives
′ 16″ exceeding that found by Calculation
2″ only.

The ſame Method of obtaining the true
ime is to be obſerved in Eclipſes of the Sun.

Having thus exhibited the Neceſſaries pre-
ratory to the Calculating of Eclipſes, I re-
r the Reader to thoſe Books that treat there-
, the which, to handle fully with their Con-
ructions, the Occultations of the fix'd Stars,
c. requires a Treatiſe of itſelf. The De-
gn of this, which was to remove the labouri-
s and tedious Operations hitherto uſed in ob-
ining the Moon's Place, being thus ended, I
all next proceed to the Deſcription and Uſes
f the Chronologer.

THE
Deſcription and Uſe
OF THE
CHRONOLOGE

THE Circumferences of the four
teriour concentric Circles round
Square in the left-hand Diagram
divided into 12 Parts, anſwering
the 12 Months of the Year; between the t
exteriour are contain'd the Mean Places of
Sun, and between the two next the Mean A
malies, and under theſe the Months with
firſt Day, and the Number of Days in each
ſpective Month; which indicates, that on
firſt Day of the Month at Noon, the M
Places of the Sun and Anomaly were as ab
expreſs'd, in the ſaid reſpective Month in
Radical Year 1736, which is placed in
four ſeveral Parts round the Square.

The three next are divided into two equal Parts
and immediately under the Months of *January*
February and *March*, is contain'd the Sun'
Mean Motion for every fourth or Leap Yea
expreſs'd in decimal Parts of a Deg. as alſo hi
Mea

lean Motion for every ſingle Year, or Year
ter Leap-Year (which can never exceed
ree) *viz.* — 14′ 20″, or 14 Minutes and 20
conds Negative, being the Quantity he falls
ort of the firſt Point of *Aries* (from which
l the Mean Motions are computed) in a Year
365 Days, and under theſe again the Mean
Iotion of the Moon for every fourth and ſingle
ear is expreſs'd in decimal Parts of the Circle,
360 Deg.

Immediately under the Months of *April,*
Iay and *June*, are the Motions of the Sun's
Iean Anomaly expreſs'd as before, and like-
iſe thoſe of the Moon's Apogé decimally ex-
reſs'd as before. Next immediately under the
Ionths *July*, *Auguſt* and *September*, are the
Iean Motions of the Sun and Anomaly for a
ay, expreſs'd in decimal Parts of a Deg. and
nd under theſe again, the Mean Motions of
e Moon's Node for every 4th, *viz.* leap and
ngle Year expreſs'd in the decimal Part of the
ircle, or 360 Deg.

Laſtly, Under the Months *October*, *Novem-*
er and *December*, are the Sun's Mean Motions
d Anomaly for an Hour and a Minute, ex-
reſs'd in Min. and decimal Parts of a Min, *&c.*
likewiſe the Mean Motions of the Moon for
Day and an Hour expreſs'd in decimal Parts
f the Circle.

The Tables in the Square are ſufficiently ex-
lain'd *per* their Titles; but if any thing
ould ſeem obſcure, it will be fully clear'd up
the enſuing Examples.

In this Right Hand Diagram the Me Places of the Moon Apogé and Node, & are digeſted as before of the Sun.

Between the two laſt concentric Circ under the Months of *January*, *February* an *March*, are contain'd the decimal Multipli to the 1° Equation of the Moon, as alſo of th Apogé $\times^r$ ſignifying Multiplier.

Under the Months of *April*, *May* and *Ju* are the Multipliers to the 1° Equation of th Node, and the Motion of the Apogé for one Da

Under the Months of *July*, *Auguſt* and *Sep tember*, are the Motions of the Apogé for a Hour, and of the Node for a Day. An next follows the Motion of the Node an Hour; and under theſe again, about Square, the Radical Year, *viz.* 1736.

The Titles of the Tables in this Square al as before of the Sun's, declare their Uſe which will likewiſe be made conſpicuous p the following Examples.

In the Table for finding the Dominical Le ter for ever by the Cycle of the Sun; after ha ving found the ſaid Cycle *per* the Rule the laid down, ſeek the ſame in the ſaid Table, an againſt it you have the Dominical Letter re quired; if there be two, as there will be ever Leap-year, then the firſt is to be uſed to *February*, and the other all the Year after.

Se

Seek the Dominical Letter thus found among Seven immediately under thoſe of the Cy- ; when the 1ſt Day of the Month, or each the Months immediately under the ſaid Do- nical Letter begins on a Sunday, the Month Months under the next Letter to the right nd on a *Monday*, the next *Tueſday*, and on till you come to the Dominical Let- again, under which you will alſo find the y of the Month that *Advent Sunday* falls

Under the Dominical Letter at the Head of Table for finding *Eaſter* for ever, and inſt the Prime (found *per* the Precept in the ble of the Cycle of the Sun) you have the Day the Month that *Eaſter* falls on; the Month t above in the ſaid Column, if not found ectly againſt the ſaid Prime.

The Terms, Returns, &c. may all be found Inſpection *per* the Precepts in the Table of Cycle of the Sun.

Having thus given what was previouſly ne- ſary to working Examples, I ſhall next pro- d thereto in all the various Caſes of the ronologer.

As the Sun is the Baſis of all theſe Calcula- ns, I ſhall firſt begin with computing his ce; accordingly let it be required (as before) * *December* 12, 1738. at 5^h. 27′ P. M.

And here it is to be always noted, that if the Months be *January* and *ary*, and not Leap-year, you muſt always compute for a Day for- r, *viz.* for 12th muſt be taken 13th, &c.

Firſt take out the Mean Places of the S and Anomaly, anſwering to the firſt of D *cember* in the Chronologer, which will $8^s\ 21^\circ\ 25'\ 46''$ the Mean Place, $5^s\ 13^\circ\ 10'$ Mean Anomaly.

Next, as the Day required is the 12th, th are 11 Days more to Account for.

☉ Mo, *per* D.	Mo. Ano. *per*
.9°8565	.9°856
11 Days.	11 D
10°.84215	10°.8416
60 *	60 *
50.5290	50.4960
60	60
31.74	29.76
☉ Me. Mo.	Anom.
That is 10°. 50′ 32″	10°. 50′. 30″

* Vide Pag. 96. Ex. 1.

Next the Time required is $5^h\ 27'$ that is d cimally expreſs'd 5.45 the Mean Motion of t Sun and likewiſe of the Anomaly for one Ho is

```
             2′.4641
Multiply by  5.45
            ---------
            12.3205
            98564
           123205
           ----------
           13′.429405
                 60
                ---
that is 13′ 26″  2″5.76433
```

wh

ch added to the Sun's Mean Motion and omaly for 11 Days found as above, gives 3′ 58″ Mean Motion and 11° 3′ 56″ Mean omaly to be added to thoſe before taken out the firſt of *December*, which gives

⊙ Mean Place	⊙ Mean Anom.
$9^s\,2^\circ\,29'\,44''$	$5^s\,24^\circ\,14'\,14''$

he Time required for the Year 1736, which muſt be reduced to the Year required 1738, Example Pag. 105, *viz.* as it is only two rs from the Radix, there muſt be twice the mbers anſwering to the Motions of a ſingle r, for the Mean Place and Anomaly be ectively deducted therefrom, *viz.* twice 20″ *i.e.* 28′ 40″ for the Mean Place, and e 15′ 20″ *i.e.* 30′ 40″ for the Mean Anomaly, which gives for *December* 12, 1738, at lours 27 Min. P. M.

Mean Place	Mean Anom.	⊙ Apogé
$^s\,2^\circ\,1'\,4''$	$5^s\,23^\circ\,43'\,34''$	$3^s\,8^\circ\,17'\,30''$

e Place of the Apogé is obtained as *per* a ner Precept by ſubtracting the ⊙ Mean Analy from his Mean Place.

Then for the Equation of the Sun's Centre ering the Table of that Title, with the ⊙ an Anomaly above found againſt the next in the ſaid Table, *viz.* 5, at the Head, 22° in the Margin, you have * 991″, and inſt 24° and under 5^s at the Head the next ater than the preſent Mean Anomaly you e 744″ the difference of theſe is 247″. Whence will be as 2 Deg. (which is always the rginal diff.) is to 247″ ſo is the diff. between

*The Numbers in this Table are all Seconds for conveniency and eaſe in Computing.

tween the next leſs and preſent Mean Anom which is here 1° 43′ 34″ to the Seconds, be applied to thoſe againſt the ſaid leſſer M ginal Numbers than the Deg. of the pre Mean Anomaly, *viz.* to be added if the ſa be increaſing, but ſubtracted if decreaſing; this Example the 247″ is decreaſing, and th diff. *viz.* 1° 43′ 34″ decimally expreſs'd is,

$$\begin{array}{lr} & 1.726 \\ \text{Multiply by} & 247 \\ \hline & 12082 \\ & 6904 \\ & 3452 \\ \hline & 426.322 \end{array}$$

which being divided by 2, the Marginal di (that is always taking the half,) you have 21 to be deducted from 991″ found as befo which gives 778″ (or 12′ 58″) the true Equ tion of the Sun's Centre in Seconds requir which being ſubtracted as the Table dire from the Mean Place of the Sun before fou *viz.* 9^s 2° 1′ 4″ gives 9^s 1° 48′ 6″ the tr Place of the Sun required, and is exactly as b fore found *per* the Tables.

☞ This ſpecial regard is to be had with the Tables, *viz.* when the Sign, &c. you en with is not to be found at the Head, you mu then ſubtract it from 12, which diff. you w always find there, when operate as before, b on the contrary, if the Head Title is ſubtra you muſt then add, and if add, ſubtract t Equation ſo found.

Th

Thus having obtain'd the Ground-work, z. the Place of the Sun, I ſhall next proceed the Uſes of the Tables depending thereon.

And firſt for his Declination.

The Place of the Sun is 9, 1° 48′ which not ing to be found at the Head of the Table, muſt therefore be ſubtracted from 12, the fference is 2^s 28° 12′ which now being found ere, and entering the Table of the Sun's eclination therewith under 2^s, and againſt the xt leſs Marginal Deg. *viz.* 24° you have 23°.347, the greateſt Declination takes ace next in the Table, which here may be ken 23.5. the difference is .153, whence it ill be as 6° the Marginal difference is to 53, ſo is 4° 12′ the difference between the id Marginal N°. *&c.* the Numbers entered e Table with to .107 *ferè*, which added 23°. 347 as the Difference was increaſing ves 23. 454 the preſent Declination required.

* The Numbers of this Table are decimally expreſs'd alſo for the eaſe of Computat.

Here it is to be noted, that when the Sign the ın is in, is under 6, it is then North Declination if above South, and is therefore in the eſent Example South Declination, as being Signs, the above Decimal being reduced, *&c.* ives 23° 27′, *&c.* and is nearly the Declination *per* Tables.

To obtain the Time of the Sun Riſing and etting, with the Length of the Day and light.

With the Declination thus found, enter the Table titled ⊙ Set. ⊙ Riſe, &c. and under the Latitude at the Head and Declination in the Margin, you have the Hour and Min. of ⊙ Set. or ⊙ Riſ. accordingly.

In the preſent Example the Declination is 23° 27′ and in this Caſe may be taken for the greateſt, *viz.* 23° ½, againſt which in the Margin of the aforeſaid Table, and under the Lat. 51 ½, you have 8^{h}. 13′ in the Morning or after Midnight for the Time of Sun Riſing, and is exactly the Time, for all other Latitudes in the ſaid Table, entering with the proper Declinations, by proportioning, you will eaſily obtain the Sun's Riſing, *&c.*

For the Length of the Day and Night.

In the preſent Example, the Time of the Sun Riſing is 8^{h}. 13′ *viz.* 8^{h}. 13′ after Midnight, conſequently there will have been 8^{h}. 13′ before Mid-night for the other half of the Night, whence proceeds this Rule, *viz.* double Sun Riſing it gives the Length of the Night and in this caſe is 16^{h}. 26′, which ſubtracted from 24, leaves 7^{h}. 34′ the Length of the Day, or if you ſubtract the Time of Sun Riſing from 12 Hours, you will have the Time of Sun ſetting, which is plain, there being 12 Hours from Mid-Night to the Noon preceeding of every Day, and as in the above caſe there being 8^{h}. 13′ (the remaining part or half of the Night) from Mid-Night towards the Noon of the preceeding Day; by ſubtracting it, therefore,

you

ou will have 3^h 47′ for the Time of Sun ſet- e. 3^h 47′ after the Noon or middle of the eceeding Day, and conſequently 3^h 47′ can : but one half of the Day, from whence alſo mes the Rule of doubling the Hours, &c. of n ſetting for the Length of the Day, which ill be found as above, and which taken from 4 Hours gives the Length of the Night as fore.

For the Equation of Time.

The firſt Part of the Equation of Time is e Equation of the Sun's Centre reduced to ime, which Equation was found to be 778″, d is reduced to Time thus, divide the ſame ways by 100, *i. e.* pointing off two Places to e Right Hand, next divide them again by * 9, e Quotient will be the Min. and Parts of ime required.

* Vid. Pag. 81.

$$
\begin{array}{lr}
\text{Thus} & 7.78 \\
\hline
 & .864 \\
 & 60 \\
\hline
 & 51.84 \\
 & 60 \\
\hline
 & 52.0
\end{array}
$$

hat is 51″ 52‴ or 52″ Equation of Time anvering to the Equation of the Sun's Centre as equired, which muſt be applied to the appant Time in the ſame Manner as before to e Mean Place of the Sun, *viz.* ſubtracted. he ſecond Part of the Equation of Time depends on the Sun's Place, with which enter t Table of that Title under that of the Sun Declination taking out the Numbers accordin ly. In the preſent Examples, the Sun's Pla is $9^{s}\ 1^{\circ}\ 48'$ (in this caſe near enough) whi being not to be found at the Head of the Ta ble, it muſt, as before noted, be ſubtracte from 12, and the Remainder (or Complemen ſought at the Head of the ſaid Table, viz $2^{s}\ 28^{\circ}\ 12'$, under 2^{s} at the Head, and 2 in the Margin the next leſs than the De to be enter'd with, you have $1'\ 48''$ or 108 and againſt 3 Signs the next greater, (the Ta ble ſerving to every 5 Deg.) it will become whence it will be as (inſtead of dividing by you may multiply by .2) 5 Deg. the Margin diff. is to $108''$ ſo is $3^{\circ}.2$ the diff. between th Deg. to be enter'd with, and the next leſs to 69 which ſubtract from $108''$ as the ſame was decreaſing, gives $39''$ the Equation of Time depending on the Sun's Place required, whic Equation as the Complement to 12 Signs wa made uſe of, muſt, contrary to the Title o the Table, be added to the apparent Time.

The firſt Part of the Equation was found t be $52''$ ablative, or to be ſubtracted, and th latter $39''$ to be added, their diff. therefor *viz.* $13''$ is the true Equation of Time to b ſubtracted according to the Title of the grea Part, and is directly the ſame by the Tables.

For the right Aſcenſion of any Point in the Ecliptic, let the right Aſcenſion of that Poin of the Ecliptic, the Sun is in, *viz.* $9^{s}\ 1^{\circ}\ 48'\ 6$ be required.

Bu

Here it will be convenient to ſhew how reduce Min. and Seconds of Time into Deg. d Min. of the Equator *, firſt divide the Sends by 4, the Quote is the Min. and the Reainder ſo many Times 15″. Alſo divide in. by 4, the Quote is Deg. and the Reainder ſo many times 15′; as ſuppoſe the eateſt Equation of Time in the Table dending on the Sun's Place, *viz.* 9′ 54″ be rered to be reduc'd to Deg. and Min. of the quator, firſt 54″ divided by 4, gives 13′ for ie Quote, and 2 Remainder, which therefore ves 30″. Next 9′ divided by 4, gives 2° for ie Quote, and 15′ for 1 the Remainder, ſo iat the true Anſwer is 2° 28′ 30″; for a Proof ereof, let the ſaid 2° 28′ 30″ be reduced all to econds, which will be 8910″, the ſame being educed to Time by the Method before in the quation of the Sun's Centre, will be as folows, thus $\frac{89\,10}{9.900}$ *i. e.* 9′ 54″ as at firſt. The ame thing may be effected by multiplying ° 28′ 30″ back again by 4, which corroborates he Work.

This being done, it is to be obſerved, that he right Aſcenſion of any Point of the Elipic differs from the Longitude of the ſaid Point more or leſs by the Equation of Time educed as before ſhewn depending on the un's Place, ſuppoſing him to poſſeſs the ſaid Point of the Ecliptic.

In the preſent Example of the Sun's Place, he Signs being reduced to Deg. the Point in he Ecliptic will then be 271° 48′ 6″ but the

S ſ

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* If there be Thirds, divide them by 4, the Quote will be Seconds nd the Remainder ſo many Times 15 Thirds.

Equation of Time before found, *viz.* 39″ i 9′ 45″ when reduced, and as the ſame was Additive, it muſt therefore be added to the above Point of the Ecliptic, which gives 271° 57′ 51″, the right Aſcenſion required, and is exactly the ſame by the Tables.

To find the right Aſcenſion in Time of any Point of the Ecliptic.

Let the right Aſcenſion in Time of the aforeſaid Place of the Sun, *viz.* 271′ 48′ 6 be required.

Here it muſt likewiſe be obſerved, that every 15° of the Equator is equal to one Hour in Time, from whence it is plain that every Quadrant or 90° is equal to ſix Hours, and from whence alſo may eaſily be deduced this Rule, *viz.*

Divide the * Seconds by 15, the Quote is ſo many Seconds, and the Remainder ſo many times 4 Thirds; next divide the Min. by 15, the Quote is ſo many Min. and the Remainder ſo many times 4 Seconds. Laſtly, divide the Deg. by 15, the Quote is ſo many Hours, and the Remainder ſo many times 4 Min.

According to this Rule in the above Example, *viz.* 271^s 48′ 6″. the 270° or 3 Quadrants, give 18 Hours, and 1° remaining. Next, the 6″ gives 24‴ and the 48′ gives 3′ 12″, and the 1° remaining 4′, amounting in all to 18^h 7″ 12′ 24‴; to which adding 39″ Equation of Time depending on the Sun's Place as the ſame was additive, litive, makes 18^{h} 7′ 51″ 24‴ the true right cenſion in Time required, or if 271° 57′ 51″ the ht Aſcenſion of the ſaid Point in the Eclip- before found be by this Rule reduced to me, it will be found the ſame: As it will o by the Tables.

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* If there be Thirds, divide by 15, the Quote will be Thirds, and the Remainder ſo many Times 4 Fourths.

Having thus diſpatched the principal Uſes the Tables in the Chronologer relating to Sun, I ſhall next proceed to the ſame for Moon.

And firſt let her Place be required accordg to the Theory to the aforeſaid Time with it of the Sun, *viz.* *December* 12, 1738, at 27′ P. M.

Mean Places in the Chronologer *Dec.* 1.

Me. Place	Apogé	Node
16° 27′ 48″	11^{s} 29° 53′ 53″	5^{s} 22° 40′ 12″

Note, It will be convenient to regiſter the llowing Equations of the Moon, &c. found by e Chronologer in a Piece of Paper, as in *Page* 3.

Next the Mean Motion of the Moon for a ſingle Year in the ſaid Chronologer is

.9594

Mult. by Years from Radix

☽ Me. Mo. *per Diem* .036601 .718802
Days from *Dec.* 1. 11

.42612 .40261

☽ Me. Mo. *per* H. .001525
Time from Noon 5.45 Dec. expreſs'd

7625
6100
7625

† .00831125 ‖ .00831

(1).12972

† Vide pag. 21.
‖ Vide pag. 98. 99.

Here the Sum Total of theſe Mean Motions amount to one Revolution, and ſo many decimal Parts of the Circle towards another, *viz.* the Decimals expreſs how far the ☽ is from the Vernal Equinox, or firſt Point of *Aries*, which being all that is required, the Revolutions or Numb. of Times that the Moon has made the Circle, are omitted.

The Decimals may be reduced according to the Rule, *Page* 98, or thus;

The decimal Parts above are .12972
Multiply by 6

77835

Mult. this laſt Product again by 6

467010

Laſtly,

tly., pointing off a Place leſs for Decimals n are the Number of thoſe ſo multiplied es the true Product in Deg. and decimal ts of a Degree 46°.70100.

The Signs the ſaid Numb. of Deg. at any e contain, are ſeen by Inſpection, each n containing 30 Deg. and is here 1^s 16° the naining Decimals being Parts of Deg. will be ınd *per* Rule, *Page* 96, to be 42′ 4″ *ferè*.

And thus there is found to be added to the ean Place of the Moon on the firſt of *De-mber* 1736, 1^s 16° 42′ 4″ which will reduce to the time required, for the Year 1738.

Motions of the Apogé and Node for a ſingle ar are

Apogé

.11295

Ye. a Rad. Mult. 2

Product .22591

6

135546

6

i. e. 2^s 21° 19′ 41″ 81°.3280

Node

.05369

Ye. a Rad. Mult. 2

Product .10738

6

64428

6

38°.6568 *i. e.* 1^s 8° 39′ 24″

Next the Mean Motions of the Apogè Node for a Day being but ſmall, it will be to operate with them in Seconds

	Apogè	Node	
Mo. *per Diem*	401″	191″	Mo. *per*
Days fr. *Dec.* 1.	11	11	
i. e. 1° 13′ 31″	4411″	2101″	*i. e.* 35

Time from Noon further required decima expreſs'd, 5ʰ. 45

Time à Noon	5. 45	5. 45	Time à
Mo. Ap. *per* h.	17″	8″	M. ☊ =
i. e. 1′ 33″ *ferè*	92″.65	43″.60	*i. e.* 44″

Which being reſpectively collected toge make 2ˢ 22° 34′ 45′, to be added to Mean Place of the Apogè, and 1ˢ 9° 1 to be ſubtracted from that of the Node the firſt of *December* 1736, which will al duce them to thoſe for the Time require the Year 1738.

Mean Places ☽, *&c.* on *December* 1, 1736, before.

	☽ Mean Place					Apogè					Node		
	s	°	′	″		s	°	′	″		s	°	
Dec. 1, 1736.	0	16	27	48		11	29	53	53		5	22	40
Reductions	+1	16	42	4	+	2	22	34	45	−	1	9	1
1738 *Dec.* 12, *&c.*	2	3	9	52		2	22	28	38		4	13	

or the 1° Equations of ☽, Apo. and Node.

The Decimal Multiplicators in the Chronolo-
, which are according to Mr. *Machin*'s Num-
s, are ſo little different from thoſe of the
eory, that they might be uſed inſtead there-
being for the latter 1° Equat. ☽ .102, for
Apogè .172, and for the Node .082, which
hall here make uſe of, the Place of the
on being required according to the Theory.

ccordingly Multiply the Seconds of the Equa-
of the Sun's Centre for the Time propoſed by
ſaid common Multiplicators, and you have
firſt Equations in Seconds reſpectively, which
ſt be added to the Mean Places of the Moon
Node, but ſubtracted from that of the A-
gè, when thoſe for the Sun's Centre were
racted; and the contrary when thoſe of
Sun's Centre were added.

n this Example, the Equation of the Sun's
tre was found 778″ to be ſubtracted in or-
to give the true Place of the Sun, which
e as follows

*−778″	−778″	−778″
.102	.172	.082
1556	1556	1556
778	13226	6224
‡+79″.356	*−133″.816	‡+63″.796
i. e. 1′.19″	*i. e.* 2′.14″	*i. e.* 1′.4″

Which

This Sign or Character, as has been ſhewn, ſhews the Numb. imme-
following to be ſubtracted.

And this to be added.

Which being applied reſpectively to the af
ſaid Mean Places, give thoſe for the firſt Tr
Equated as follows, *viz.*

☽ Me. Place	Apogè	Node
2ˢ 3° 11′ 11″	2ˢ 22° 26 24″	4ˢ 13° 26;

For Second Equation of ☽.

In the Table under that of the Sun's De
nation on his Place, you have that of the
cond third Var. (*i.e.* Variation) ſixth and
venth Equations of the Moon; where that for
ſaid ſecond Equation is 214″ next with the S
Mean Anomaly, which here may be
5ˢ 24° enter the Table of the Increment to
Variation of the Moon, ſeeking the Sign
its Complement at the Head of the Tab
the Equation of the Sun's Centre, which is
Example is 5 Signs, under which, and ag
the Deg. in the Margin of the ſaid Incre
Table, which is alſo here 24°, you hav
Equation in Seconds, which in the Vari
muſt always be added thereto, but in the
cond Equation, only one tenth thereof, as
preſs'd by the conſtant Multiplier under
ſecond Equation 214″ before taken out fro
Head of the Table, anſwering to the afore
5ˢ 24° the Sun's Mean Anomaly are 240″.
crement one tenth of which, *viz.* 24″ mu
added to 214″, which makes 238″; nex
tract the Place of the Apogè firſt equated
that of the Sun before found, *viz.* 9ˢ 1° 4
and with the difference which in this Exa
will be found 6ˢ 9° 21′ 22″ ſeeking the Sig
its Compliment at the Head of the Table
decli

clination ☉ on his Place, which here is 6, and ainſt the Deg, &c. (proportioned if required) the Margin of the ſaid Table for ſecond ird, &c. Equations, take out the Decimal anering thereto, by which multiplying the ove 238″ gives the preſent Equation in Sends required.

Under 6^s and againſt 8° in the Margin, is e Decimal .2756, and againſt 10° .342, the ff. is .0664, half of which the Marginal ff. being always 2° is .0332, which multiied by 1. 36 the diff. between the leſſer Marnal Deg. *viz.* 8° and that to be enter'd with above, gives .0452 *ferè* to be added to the ecimal againſt 8° the ſaid leſſer Marginal eg. *viz.* .2756, which makes

```
                                .3206
Equat. as before found           238″
                               25664
                               9624
                              6416
                              ______________
rue ſecond Equat. required    76″.3504, i.e. 1′ 16″
```

hich as the Sign entered with, was immediely found at the Head of the Table and not s Complement, muſt therefore according to e Title, as expreſs'd in the Margin, be ſubacted from the Mean Place of the Moon firſt quated, which gives her Place the ſecond ime Equated, *viz.* 2^s 3° 9′ 55″.

For the third Equation of ☽.

At the Head of the Table (as before of th ſecond Equation) you have 47″ for the thir Equation, next with the Diſtance of the Node, firſt Equated, from the Sun, *viz.* $4^{s}\ 18^{\circ}\ 21'\ 59$ (as before with that of the Apogè for the ſecond Equation) take out the Multiplier anſwering thereto, by which multiplying the ſaid 47″ gives the preſent third Equation requir'd.

As the ſaid Diſtance of the Node from the Sun cannot be found at the Head of the Table, therefore you muſt enter with its Complement, *viz.* $7^{s}\ 11^{\circ}$, *&c.* when the ſaid Multiplier will be found to exceed .99, which being ſo near Unity, it may be taken for it, by which the whole 47″ will be the Equation required to be added contrary to the Title of the Table as the Complement was made uſe of, which gives $2^{s}\ 3^{\circ}\ 10'\ 42''$ for the Place of the Moon the third Time equated.

For the ſecond Equation of the ☽'s Apogè.

In the Table ſo titled, the Equations anſwering to every five Deg. are expreſs'd in Deg. and decimal Parts of a Deg. as comprehending more Matter in the Spaces confin'd to, and alſo more ready for Uſe.

Enter the ſame with the diſtance of the Apogè the firſt Time equated from the Sun (being the ſame with that for the ſecond Equation) when proportioning with the * Marginal diff.

as

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* Which being always 5, inſtead of dividing thereby, multiply by .2.

n other Tables you will obtain the Equa-
1, accordingly, which here will be found
15′ 22″ to be added to the Place of the A-
gè the firſt Time equated, which gives
25° 41′ 46″ for the true Place of the Apo-
which being ſubtracted from the Place of
Moon the third Time equated, gives the
on's Mean Anomaly, and in this Example
11^s 7° 28′ 56″.

For the Mean Elliptic Equation of ☽.

With the Mean Anomaly, or its Comple-
nt, enter the Table of the Mean Elliptic
uation of the ☽, and take out the Equation
like Manner, as in the other Tables, which
l be found in this Example 2° 16′ 12″ to be
led to the Place of the Moon the third Time
ated, next to reduce this to the true, *Vide*
following Precepts.

For the preſent Eccentricity ☽.

Enter the Table of that Title with the di-
nce of the Apogè firſt time equated from
Sun, and take it out in Manner as other
bles, which in this Example will be 6625.

xt for the Uſe of the Table of Reduction of
he Mean to the true Elliptic Equation ☽.

Immediately under the Title, is to be under-
od the Anomalies of the ☽ to every ½ Sign
15° for the firſt 6 Signs. Next under thoſe
pectively, and againſt 6678, which is the

greateſt

greateſt Eccentricity, are the Seconds to be a
ded to the Mean Elliptic Equation, whi
gives the True.

At the Mean Excentricity, *viz.* 5505, t
Mean Elliptic Equation is the True. Agai
the leaſt Eccentricity, *viz.* 4432, you have t
Seconds alſo under each reſpective Anomaly
be ſubtracted from the Mean Elliptic Equ
tion, which then gives the True.

Laſtly, the ſmall Numbers againſt the M
Eccentricity, are for finding the Seconds whi
before was but to every ½ Sign, or 15° to eve
7° ½ of Anomaly. Thus,

Add any two Numbers * of Seconds a
Sign, or 15° of Anomaly diſtance togethe
next to half of this Sum, adding the ſm
Numbers directly between them, gives the S
conds required at 7° ½, or Arithmetical M
between the ſaid two Anomalies.

This being premis'd, I ſhall proceed to
Illuſtration thereof, in the preſent Example.
which the Anomaly (*viz.* its Complement a
exceeded 6 Signs) is $0^s\ 22^\circ\ 31'\ 4''$, next as
preſent Eccentricity exceeds the Mean, the
conds anſwering to the ſaid Anomaly agai
the greateſt Eccentricity muſt be ſough
but when the preſent Eccentricity is leſs t
the Mean, than the Seconds againſt the
Eccentricity anſwering to the then Anom
muſt be ſought. The aforeſaid Anom

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* Againſt the greateſt or leaſt Eccentricities 'tis the ſame thing.

. 0^s 22° 31′ 4″, being between ½ Sign,
- 15°, and 1° or 30°, the Seconds reſpec-
ely under them, *viz.* 1089 and 2126, being
led together, make 3215, to half of which
ling the 10 directly under and between them,
kes 1617″, for the Equation to be added to
Mean Elliptic Equation, which gives the
ue at 22° ½, Mean Anomaly and the great-
Eccentricity 6678. But the preſent Ano-
aly exceeding * 22° ½, the Exceſs muſt be
oportion'd for, thus: The Diff. between
17″, and the next greater, *viz.* 2126 is here
09″, whence it will always be as 7° ½ (the
nſtant Difference) is to the Difference of
conds, thus found; ſo is the Exceſs of the
eſent Anomaly above that before found in the
able (which is here alſo 1′ 4″) to the Seconds
be added to thoſe alſo before found, againſt
ie greateſt or leaſt Eccentricity. The 7° ½
eing always a conſtant Diviſor, and as Mul-
plication is eaſier than Diviſion, inſtead of
ividing thereby, multiply by .13, gives the
nſwer required.

509

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* Which in this Caſe might have been taken for it, but only to clear
p future Operations.

505
Dec. 1′ 4″ .017

3565

3953
509

9.046
.13

30165
9043

Anſwer 1″, 1.20651

† Vide pag. 81.

In the firſt Multiplier the 7, as it exceeds 5, might have been made 8; and in the 2d. 3, as under, might have been us'd only as a ſingle 3.

* Vide pag. 68. Ex. 3.

which 1″ added to 1617″ makes 1618″ th Number of Seconds anſwering to the pre Anomaly at the ſaid greateſt Eccentricity.

Next, to reduce theſe to the Number of Se conds anſwering to the preſent Eccentricity, a the ſame, *viz.* 6625, exceeds the Mean, 550 ſubtract the ſaid Mean therefrom, the Dif. 1120, in which Caſe it will always be as th Difference between the Mean and the grea Eccentricities, *viz.* 1173 (which is conſta is to the Number of Seconds before found a-gainſt the greateſt Eccentricity (in this Exa-ple 1618) ſo is the Difference between th Mean and the preſent Eccentricity (which here 1120) to the Seconds required.

1618″
1120

19416
1618

1173) 1812160 (1545″ *fere.*
6391‥
5266 *i. e.* 25′ 45″
5740
1048

ich 25′ 45″, as the preſent Eccentricity is
ater than the Mean, being (as it muſt al-
ys be in ſuch Caſe) added to the Mean El-
tic Equation before found, *viz.* 2° 16′ 12″
es 2° 41′ 57″ true Elliptic Equation, to
added to the Place of the Moon the third
me Equated, which gives her Place the fourth
me Equated, *viz.* 2^s 5° 52′ 39″.

When the preſent Eccentricity is leſs than the
an you muſt operate in all reſpects as before,
h the Seconds found in like manner againſt
leaſt Eccentricity and Difference between the
ſent and Mean Eccentricities, &c. which then
ſt be ſubtracted from the Mean Elliptical E-
ation, to give the True. *Vide* Page 24.

For the Variation of the ☽.

From the Place of the Moon the fourth Time
uated, ſubtract the Place of the Sun, and
h the Difference (or its Complement) which
this Example is 5^s 4° 4′ 33″, enter the
Table

Table as before for the ſecond Equation, take out the Multiplier anſwering thereto, will be found .7867, next in the ſaid Ta the Head you find Var. N. *i. e.* the Va according to Sir *Iſaac Newton*, to be 33 then, with the Mean Anomaly, entering Table of the Increment thereto, it will be as before, with the ſecond Equation, to be or 4′, which added to 33′ 12″, as above, 37′ 12″.

Decimal Multiplier
Variation

23

i. e. 29′ 16″ *ferè* 29

to be ſubtracted, contrary to the Title in Margin, as the Complement was uſed, the Place of the Moon the fourth Time E ted, which gives $2^{s}\ 5^{\circ}\ 23'\ 23''$, the Pla the Moon the fifth Time Equated.

For the ſixth Equation of ☽.

From the Place of the Moon the fifth Ti Equated ſubtract the Place of the Sun, w in this Example is $5^{s}\ 3^{\circ}\ 35'\ 17''$, alſo the true Place of the Moon's Apoge ſu the Place of the Sun's Apoge, which here $11^{s}\ 17^{\circ}\ 24'\ 16''$. Add theſe tw mainders together, rejecting the Circle or Signs, if they exceed it, next with hal

n or Remainder above 12^s, or the Circle,
ich here is 2^s 10° 30′ 16″, take out the
ltiplier anſwering thereto, which will be

.6293
145 Equ. à Table.

.31465
88102

*91.2485 *i. e.* 1′ 31″

ich 1′ 31″ being ſubtracted from the Place
the Moon the fifth Time Equated gives
5° 21′ 52″ for the Place of the Moon
: ſixth Time Equated.

For the ſeventh Equation ☽.

From the Place of the Moon the ſixth Time
uated ſubtract the Place of the Sun, which
ves 5^s 3° 33′ 46″, with the half of which ta-
ng out the Multiplier, as in the laſt Exam-
s, it will be found .4451, by which multi-
ying 145″, as ſerving indiſcriminately for
th Equations, you will have 1′ 4″, which E-
ation likewiſe follows the Rule of the laſt,
hich being therefore alſo ſubtracted from the
ace of the Moon laſt Equated, gives 2^s 5°
′ 48″ for her Place the ſeventh Time Equa-
d, which according to the Theory is her
lace in her Orb.

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* This Equation is to be ſubtracted when the Sign you enter with is un-
3, but added when above.

For the true Place of the Node.

With the Diſtance of the Node firſt Equat from the Sun (as found for the third Equatio *viz.* 4^s 18° 21′ 59″, enter the Table of the cond Equation thereof in manner as of that the ſecond Equation of the Apogé, which the ſame Reaſon is alſo expreſs'd in Deg. a decimal Parts, which ſaid Equation will found by the Methods uſed in the other T bles to be 1° 28′ 32″ to be ſubtracted fr the Place of the Node firſt Time Equat which gives 4^s 11° 57′ 35″ for the true Pl of the Node required.

For the Inclination of the Limit.

The Inclination of the Limit at 7^s is 13′, a againſt 8 it is 4′ the Diff. is 9′; next, as Deg. you entered with was 11.63, it will be 30° or 1^s is to 9′, ſo is 11.63 to 3′ *fere*, wh ſubtracted from 13′ under 7 gives 10′ for preſent Inclination of the Limit.

Next, ſubtract the true Place of the N from the Place of the Moon in her Orb, wh Diſtance in this Example is 9^s 23° 23′ 13″

For the Reduction and Exceſs.

With the Diſtance, or its Complement, the Node à ☽ in her Orb, enter the reſpec Table, which Numbers are here in Min and Seconds, when the ſimple Equation anſw ing thereto will be found 4′ 45″; next, for

Ex

eſs at the ſame Time, it will be as 30° or to 42″ (which it is found to decreaſe in the 30°) ſo is the Deg. entered with above the Sign to 8″, to be ſub. from 42″, which gives the Exceſs anſwering to the aforeſaid ſimple uction, which Exceſs muſt again be reduc'd , as 18′, the greateſt Inclination of the Li- , are to 10′, the preſent Inclination found as re, ſo is the Exceſs at firſt taken out, which is 34″ to 19″ *ferè*, the preſent Exceſs to be ed to the ſimple Reduction before found, ch gives 5′ 4″, the preſent Reduction and eſs, which is to be added to the Place of Moon in her Orb, which gives $2^s\ 5^d\ 25'$ for her Place in the Ecliptic.

For the Latitude of the ☽,

With the aforefound Diſtance of the Node m the Moon in her Orb entering the reſpec- Table, the ſimple Lat. will be found 4° 41″; and here it is to be noted, that when make uſe of the Complement in entering Table, the Latitude will be directly oppo- in Name to what you find at the Head of Table, as in this Example it is found to be rth aſcending; but as the Complement was de uſe of, the Latitude will therefore be uth deſcending, the Increment is thus found, greateſt is 18′, but at the Head of the Ta- under 2^s, the Complement, *&c.* entered th, you will have 16′, wherefore in 30° there ll be but 2′ Increaſe; ſo that it will be as ° is to 2′, ſo is the Deg. *&c.* entered with, z. 6°.61 to .44 or 26″ to be added to 16′ the Head of the Table, as before, whence

the preſent Tabular Increment will be 16
which muſt be reduced as was the Exceſs,
as the greateſt Inclination of the Limit is
rather in this Caſe for the Lat. * 17′ 45″
to the preſent taken out at the Equation of
Node, *viz.* 10′, ſo is 16′.44 to 9′.16″,
preſent Increment, which added to the f
Latitude before found, gives 4° 43′ 57″ for
true Latitude South deſcending of the ☽
quired, and is within 7″ *per* the Tables.

And thus is the Place of the Moon,
ſtrictly computed according to the Theory
the *Chronologer*, when, if every reſpectiv
quation be taken from the Tables, and co
red therewith, there will be found ſcarce
Difference, or at moſt none that is confide

The ſame might alſo have been done
three Equations only, as in *Page* 164, m
uſe at the ſame Time of the Variation, *V*
i. e. according to Mr. *Machin*; but the Th
containing more Operations, I judg'd, th
Example according thereto would be moſt
ducive to the clearing up all Difficulties
may ariſe in theſe Calculi.

For the Right Aſcenſion of ☽.

Find the Right Aſcenſion of that Point of
Ecliptic ſhe is in, as before, of the Sun (*p.*
which will be found to be 63° 30′ 22″,
which in Time is 4h 14′ 1″.

F

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* Inſtead of dividing you may uſe the common Multiplier .563

For the Moon's Southing.

From the Right Aſcenſion of the [†] Moon in me at Noon of that Day ſubtract that of the un, adding 24^h if Sub. cannot otherwiſe be de, the Remainder will be nearly the Time the Moon's Southing, to which adding 2 min. d ⅙ for every Hour of the ſaid Remainder, u will thereby obtain it ſtill more accurate.

	h.	′	″
Right Aſcen. ☽ in Time	4	2	57
Ditto ☉.	18	6	52
Rem. P. M.	9	56	5
or the Hours of the Remainder		21	30
ime of ☽'s Southing not regarding the Lat.	[*]10	17	35

Next, to equate for the Lat. it muſt be obrved, that when the greateſt Latitude takes lace, *viz.* about 5°, there will then be about ′ of Time Difference of her Southing, found as bove, which may be eſtimated in other Latiudes near enough by Proportion.

Then to find when it is to be added or ubtracted, obſerve this Rule.

If the Moon's Place is between the firſt Deg. f ♋, *viz.* 3 Signs, and that of ♑, *viz.* 9 Signs, nd her Lat. be North, you muſt then add the ſaid Min. to the Time of her Southing; but if her Lat. be South, you muſt then ſubtract them. Again, if her Place ſhould be between the firſt Deg. of ♑, *viz.* as before, 9 Signs, and ♋, 3 Signs, and her Lat. South, you muſt then add the ſaid Min. but if North, you muſt ſubtract them to and from the Time of her Southing, found as before.

[†] Whoſe true Place is then (*viz. Dec.* 12. 1738.) 2^s 2° 48′ 6″

[‡] Ditto. 9 1 34 23

[*] When the Hours exceed 12, it is called ſo many Hours in the Morning, as is the Exceſs above 12.

In the preſent Example the Moon's Place, *viz.* 2^s, *&c.* is between 9 and 3, and her Lat. S. being alſo nearly at her greateſt Lat. the 8′ may be taken, the which, according to the Rule, being added to her Southing before found, gives $10^h\ 25'\ 35''$ for the true Time of Southing.

For the Declination of the ☽.

Find the Declination of that Point of the Ecliptic ſhe will be in, * (as before of the Sun,) which in this Example will be found 21° 35′ *fere.*

Next, for every Deg. of Latitude allow 5′, which in this Example being nearly 5, will be about 25′, for the ☽'s Lat. the Min. ſo found, always take place when the Moon, *&c.* is in the firſt Point of *Aries*, or 0 Signs, and decreaſes to 0, when ſhe comes to the firſt Point of ♋, or 3 Signs, when it increaſes again in the ſame manner as it decreaſed (in both which it is nearly in Proportion) 'till it arrives to 25′ again at the firſt Point of ♎, or 6 Signs, when it obſerves the ſame alternate Method with the other 6 Signs; if the Lat. had been but 3°, then there

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* By adding to her Place at Noon ½ Deg. for every Hour, *&c.* after her Southing.

ere would have been but 15′ to have obſerved is Order, &c.

In this Example the Moon's Place being 8°, &c. falls within the firſt 3 Signs, and as e aforeſaid 25′ will vaniſh at the End of 3 igns, at that rate it will loſe about 8′ at the nd of every Sign, and conſequently 16′ at e End of 2 Signs, and as the Moon is about °, or a fourth Part of a Sign farther advan- ed, there will be a fourth Part of 8′ more de- reaſed, *viz.* 2′, which added to the 16′, make 8, which being now ſubtracted from 25′, as bove, leaves 7, anſwering to the Place of the Ioon, which muſt always be ſubtracted from er Latitude, and the Remainder, which in this xample is 4° 53′ 50″, to be applied as follows.

It has been before ſhewn, that the Points of he Ecliptic in the firſt 6 Signs are of North eclination, and thoſe of the latter South.

Therefore, when the Latitude of the Moon hall happen to be of the ſame Denomination, *viz.* North or South, with the Declination of the Point of the Ecliptic found as before. Then this Remainder muſt be added thereto, otherwiſe it muſt be ſubtracted, which gives the preſent Declination of the Moon required.

In this Example the Declination of the Point of the Ecliptic before found is.

	°	′	″
North	21	35	0
Rem. as above (Lat. ☽ being S.)	4	53	50
Remains ☽'s Declin. North	16	41	10

But, when the Lat. is greater than the Declination of the Point of the Ecliptic, the ſai Declination muſt be taken therefrom, whe the Difference will be the Declination requir of the ſame Denomination with the Lat.

For the Riſing and Setting of the Moon.

From the Change to the Full it is called h Setting.

From the Full to the Change her Riſing.

In the preſent Example, by ſubtracting th Sun's Place from the Moon, it will be foun as has been before, to be a little above 5^s di tant from him; therefore as ſhe is not come t the Oppoſition or Full, it will be her Settin to be ſought for.

In order to which, with her Declination ju found, enter the Table of the Riſing and Se ting of the Sun, as if it was the Sun's Declin tion, (which in that Caſe would be the Ti of his Setting) and take out the Setting of th Sun anſwering thereto, *viz.* 7^h $29'$, to whic add the Time of the Moon's Southing, and many times $2'\frac{1}{6}$ as are the Hours of the Moo Southing after Noon, and you have the Time the Moon's Setting required.

	h.	′	″
ıe of the Sun's Setting with ıe Decl. aforeſaid	7	24	
Time of Moon's Southing †	10	24	47
Equation for ditto		21	42
ıe of the Moon's Setting n the Morning required	6	10	29

[he Time of the Moon's Southing, with
Equation, is the Time of her Continuance
ve the Horizon after Sun-ſet, and in this
ımple 10 h. 46′ 29″.

For the Moon's Riſing.

Here it is to be obſerved, that in this Caſe
Moon's Southing will always be found 12^{h}
more after the Sun, which ſubtract from 24^{h}
Remainder will be the Time ſhe ſouths be-
e the Sun of the ſucceeding Day.

Next, as before of the Setting, you muſt now
:h the Declination of that Point of the Eclip-
the Moon is in at her Southing, find what
me the Sun would riſe there with, from * which
ıtract the Time of the Moon's Southing be-
e the Sun, found as above, which gives nearly
: Time of her Riſing; but to be ſtill more
:urate, ſubtract the ſame from the Time of
: Moon's Southing firſt found after the Sun;
ıen deducting therefrom ſo many times $2'\frac{1}{12}$
are the Hours, *&c.* of this laſt Difference,
ves the true Time of her Riſing required.

* Firſt adding 12 ho. if requiſite.

And here it is to be noted, that when the
ime of the Moon's Southing before the Sun

Xx is

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† In the laſt Example 2 min. one ſixth was uſed, which ſhould be but
nin. one twelfth, when it will be as above.

is greater than that of the Sun's Riſing, ſo as before, the Moon's Riſing is then ſaid to b ſuch a Time after Noon of the ſame Day; when leſs, at ſuch a Time of the ſucceed Morning.

Example.

Let the Moon's Riſing be required *Dec.* 1738. at which Time at Noon the ☉'s P ♑ 7°. 41′, and the Moon's ♌ 14° 15′, 9ˢ. 7°. 41′. and 4ˢ. 14° 15′

	h.	′
* ☽ Right Aſcen. in Time	9	6
☉ ditto	18	33
	14	33
Equation for Hours, &c.		30
True Time of Southing.	15	3
Compl. to 24ʰ ☽'s So. before ☉	8	56
☉ Riſe in 14° ♌ ☽'s Place above	4	30
☽ So. bef. ☉ à ☉ Riſe. (+12 ho.)	7	33
For 7ʰ ½ diff. à true Time ☽'s Southing ſubtr. *ferè*		15
True Time of ☽'s Riſ. Aftern.	7	18

The Difference of the true † Times of the Moon's Riſing and Southing doubled, with many times 2′ ‡ as are the Hours of the Difference, gives the Time of her Continua above the Horizon.

Having thus (as before of the Sun) gone th the Tables of the Chronologer with reſpect

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* At which Time ſhe has no conſiderable Latitude.

† 15 h. 3 min. 48 ſec. leſs 7 h. 18 min. 10 ſec. doubled gives 31 min. 16 ſec. to which adding 16 min. 10 ſec. for the Difference, 15 h. 47 min. 26 ſec. for the Time above the Horizon.

‡ When the ſaid Double exceeds 24 h. ſubtract 24 h. therefrom, th mainder is the Anſwer.

Moon, I ſhall next proceed to its Uſe in covering of Eclipſes for any Time paſt, or come.

And firſt Hiſtory makes mention of a to- Eclipſe of the Sun predicted by *Thales*; ; Years before Chriſt, by which Eclipſe nemorable Battle between the *Medes* and *lians* was put an end to, and Peace enſued reon.

From the Birth of Chriſt to the Radical ar 1736, are

Compleat Years 1735
Years before Chriſt 585

†4)2320(580

† Vide p. 113.

4 Year. °	☽'s 4 Year. Cir.	☊ 4 Year. Cir.
.030356	.4742*0	.21491
580	580	580
242848	37936	171928
151780	23710	107455
	Rev. 275)036—	Rev. 124)6478+
7°.60648,	6	6
60	216	38868
36'.3888	6	6
60	12°.96	233°.208
23".328	60	60
	57'.6	12'.48
	60	60
	36"	28.8

X x 2

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* Which will always be found ſufficient.

10 Next, to eſtimate the Time of the Year i Eclipſe ſhall happen, we muſt, as has been a ready ſhewn, always have regard to the Pa of the Node; accordingly in this Exam there has been found 7^s 23°, &c. to be ad (as going back) to the Mean Place of the No on the Firſt of any of the Months in the Ra cal Year 1736, to reduce it to that for t Time here gone back to, when it will be b to begin with the Month of *January*, on wh the Radical Mean Place thereof is 6^s 10°, & to which adding 7^s 23°, gives 2^s 3°, *viz.* for its Place, which Sign the Sun does not e ter till *May*, which is the Month we muſt a direct our Courſe to. Accordingly the Me Places of the ☉, ☽, and ☊, on the Firſt of t ſaid Month in the Radical Year 1736, ar follow,

	☉	☽	☊
	s ° ′ ″	s ° ′ ″	s °
May 1. 1736	1 20 30 4	2 16 42 53	6 4
2320 Ye. back	— 17 36 23	—1 2 57 36	+7 23 1
Mean Places	1 2 53 41	2 3 45 47	1 27 1

Here the Sun is above 24 Deg. diſtant fr the Node, and conſequently could ſuffer no clipſe the preceding Part of the Year.

It may alſo be obſerved, that the Moo juſt paſt the Conjunction, wanting nearly Signs of the next, which reduced to Deg. a the ſame divided by 12, will give the Day the next Conjunction, *viz.* 329, divided by gives a little more than 27 Days, which ad to the firſt Day of the Month, gives

the Change, at which Time the Sun will be
out 27° farther, and alſo within 3° or 4° of
e Node, allowing it to go back a Degree,
d * conſequently will then ſuffer an Eclipſe;
d is the ſame Day of the Month mention'd by
r *Iſaac Newton* in his Chronology. If it be
quired what Day of our Week this anſwers
, the Cycle of the Sun muſt firſt be found,
hich for any Time back will be as follows.

* *Vide pag.* 293.

Subtract *9 from the Number of Years before
hriſt, divide the Remainder by 28, laſtly
btract the Remainder, if any (if none, 28 is
e Cycle) from 28, this laſt Remainder will
e the Cycle required, which in this Example
ill be found to be 12, and the Dominical
etter G; whence the firſt Day of *May* fell
n *Tueſday*, and conſequently the 28th, whereon
is Eclipſe happened, on a *Monday*, in the
85th Year before Chriſt.

In the ſame Manner with the proper Num-
ers may the Prime be found for any Time
ack, *viz.* by ſubtracting 1, and dividing by
9, *&c.*

Joſephus writes, that an Eclipſe of the Moon
receded a little the Death of *Herod* the Great,
n whoſe Time our Saviour was born, which
he learned *Nicholas Man*, Eſq; preſent Maſter
f the *Charter-Houſe*, writes in his Chronology,
vas computed by *Kepler*, as it is alſo by Mr.
Vhiſton in his Aſtronomy, to have happen'd in
he 4th Year before our Common Æra of the
irth of Chriſt.

Compleat

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* When the Number of Years back exceed 9, otherwiſe they muſt be
ubtracted from 9, the Remainder is the *Cycle*.

Comp. Ye. from Chriſt's Birth 1735 as before.
Before ditto 4

4)1739(434
(3)

Which prepared will be * 435 Years to go back, and 1 ſingle Year forward therefrom.

☉	☽	☊
.030356	.4742	.21491
435	435	435
151780	23710	107455
91068	14226	64473
121424	18968	85964
13°.204860−	206).2770−	93).48585+
60	Sin. Year .3594+	Si. Ye. .05369−
12′.2916	.0824+	.43216+
60	6	6
17″.496	4944	259296
	6	6
	29°.664	155°.5776
	60	60
	39′.84	34′.656
	60	60
−13° 12′ 17″		
Sin. Ye. 14 20	50′.4	39″.36
−13° 26′ 37″	+0^s 29° 39′ 50″	+5^s 5° 34′ 36″

By adding theſe Numbers of the Node thus found to thoſe in the Radix on the Firſt of *January*, it will be found, that the Sun will not be there till about the latter End of *February*, or Beginning of *March*, the Mean Places in the Firſt of *March*; therefore are as follow.

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* *Vide* pag. 113, 114.

	☉				☽				☊			
	s	°	′	″	s	°	′	″	s	°	′	″
Radix	11	20	22	36	11	22	57	17	6	7	13	48
	—	13	26	37	+	29	39	50	+5	5	34	39
4th Ye.bef.Xt.	11	6	55	59	0	22	37	7	11	12	48	27

Here the Sun is (according to their Mean Places) about 5° from the Node of the Moon, and ſubtracting the Sun's Place from her's ſhe will be found to be about 45° Diſtant, which divided by 12, gives nearly 4 for the Number of Days ſince the Conjunction, for which deducting about 4 Deg. from the Sun's Place, he will ſtill be but about 9 Deg. from the Node, and conſequently there was then an Eclipſe of the Sun, *viz. Saturday* the 26th of *February* being Leap-Year, and the *Cycle* * ☉ 5.

Next, by adding 6 Signs to the Place of the Sun, you will have the Oppoſite thereto, *viz.* 5ˢ 7°, from which ſubtracting that of the Moon, *viz.* 0ˢ 22°, the Difference 4ˢ 15° will be what ſhe wants of the ſaid Oppoſition, which being reduced to Deg. and divided by 12, as before, gives above 11 Days for the Time of the Oppoſition, for which adding 11 Deg. to the Place of the Sun, he will ſtill be within 6 Deg. of the Node, and conſequently there was then an Eclipſe of the Moon, *viz.* on the 12th Day of *March*, &c.

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* The *Cycle* of the Sun being 9, the Year of the Birth of Chriſt, by ſubtracting 4 the Number of Years before therefrom, leaves 5, the *Cycle* of the Sun required.

Having found the Day that there will be an Eclipſe, in order to compute the Time nearly accurate, you muſt find the true Place of the Sun, next that of the Moon's Apogè in ſame manner as that of the Mean Place and Node, from whence you may eaſily obtain the Moon's Anomaly, as alſo the Elliptic Equation, by which you cannot fail of eſtimating the Time to a very ſmall Matter (*vid.* p. 297, 298, 299.) and here is found to be * 15 h. &c. P. M. of the ſaid Day, agreeing with the Time compu by Mr. *Whiſton*, the latter End of his A nomy, by which it is evident, that the v Æra of Chriſt is at leaſt 4 Years too late.

The true Year of the Birth of Chriſt, the aforeſaid *Nicholas Man*, Eſq; in his Book of Chronology, has prov'd to be juſt Six Years before the ſaid vulgar Æra.

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* *Monday, March* 13. at 3 o'Clock in the Morning.

ECESSARY PROBLEMS ſolved by the Help of the Chronologer.

PROB. I.

ANY Year, Month, and Day being given, to find the Day of the Week.

Find the Cycle of ☉ by Rules
fore given, and the Dominical Letter, whence
e Week-Day of the Firſt Day of any Month
ll, as before ſhewn, be eaſily obtained, and
the continual Addition of 7, you will have
e 8th, 15th, 22d, and 29th of the ſaid Month
the ſame Day of the Week alſo, and from
ence what Day of the Week any other Day
the ſaid Month is.

Example.

What Day of the Week was the * 12th of
larch in the 4th Year before Chriſt, the Day
hereon the Eclipſe of the Moon before com-
ıted happened.

The ſuppoſed Year that Chriſt was born
e Cycle of the Sun was 9, from which de-
ıcting 4, there will remain 5 for the * Cycle
the Sun, the Dominical Letters anſwering

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* *Vide* p. 343.

thereto in the Chronologer are B A, theref it was Leap-Year, which laſt, *viz.* A, mu be uſed as the Day required is after the 2 of *February*, whence counting from A as *Su day*, the Months under B begin on a *Mon* under C *Tueſday*, and under D, where *Ma* is, on a *Wedneſday*; wherefore the 8th wil on a *Wedneſday*, and conſequently the 12th a *Sunday*, as required. B, the firſt of the D minical Letters is to be thus uſed, *viz.* to 24th of *February*, 'till which Time the P B poſſeſſes muſt be called *Sunday*; conſeq ly *January* will begin on a *Saturday*, and *Fe ruary* on a *Tueſday*, the other Days thereof low the Rule.

The Converſe of this, *viz.* having the Ye Month, and Day of the Week, to find the D of the Month, can no otherwiſe be ſolv'd by giving ſo many Days of the ſaid Mont the ſaid Day of the Week can happen when there will ſtill be required to know w ther it was the firſt, ſecond, third, or fo Week of that Month in order to be cert unleſs it be attended with ſome other Circ ſtance, as being in *Eaſter*, *Whitſuntide*, or ſo other remarkable Day, &c.

PROB. II.

To find the *Foreign* or *Gregorian Domi Letter.*

Firſt, find the *Julian*, or ours, the third pr ceding excluſive thereof is the *Foreign Dom cal Letter* required. The Reaſon hereof is, m the *Julian Dominical Letter* excluſive, a- ong the ſeven under thoſe, containing the *Cy-* r, *&c.* you count eleven to the Right-hand; Number of Days they are before us, it will minate the third preceding as before, when y come to be 12 Days before us, it will then the fourth, *&c.* which *Dominical Letter* is to uſed in their Account as the *Julian* in ours.

Example.

* In the Year 1739. the *Gregorian Dominical tter* is D, whence their Firſt of *February*, *arch*, and *November*, fall on a *Sunday*, from ch of which ſubtracting 11 Days, gives *Ja- ary* 21, *February* 18, and *October* 21, anſwer- g thereto in our Account, and are alſo *Sun- ys* with us, the Days of the Week in the o- er Months follow the Rule.

PROB. III.

Having given the Day of the Month *Eaſter* any Time falls on, to find what Years of our ord it ſhall happen on the ſame Day of the onth for ever.

Let the 25th of *March* be the Day of the onth required, which, according to the old overb, is, when *my Lord falls in my Lady's p*.

Here it may very eaſily be computed, that if e 25th of *March* is on a *Sunday*, the 22d will

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* The Year 1740 being Leap-Year, F E are the *Julian Dominical Let-* , the Third excluſive preceding F is C, and the Third preceding E is whence the *Gregorian Dominical Letters* are C B.

be on a *Thurſday*, and ſo of conſequence w be alſo the Firſt; next ſeek *March* under Dominical Letters* which you will find under D, call that *Thurſday*; then count on to the Rig calling the next, *viz.* E, *Friday*, F, *Satur* G, *Sunday*, whence it will be found that 25th of *March* can never happen on a *Su* but when the *Dominical Letter* is G.

Then find among the *Cycles* and *Domi* *Letters* how often you can find G there, w in Leap-year muſt be the laſt Letter, as be for the Month of *March*, taking out the ſe ral *Cycles* of ☉ againſt it, which will be fo to be 6, 12, 17, 23.

Laſtly, in the Table of finding *Eaſter* ever, ſeek the *Dominical Letter* G, it being pr ed, that *Eaſter* (or any) *Sunday* can never h pen on the 25th of *March* but then, which you will find, that this will always h pen when the Prime is either 5, 13, or and not elſe; therefore, when the Prime i *Eaſter* will happen, if the *Cycle* of the Su either 6, 12, 17, 23, *viz.* four Times wit Prime 5, and with the three Primes three t four, in all 12 Times; but the aforeſaid *Cyc* the Sun can ſo happen but once in 28 Years, the Primes but once in 19 Years, where the whole 12 Times can ſo happen but i Times 28 Years, *viz.* 532, which is the *nyſian* Period, after which all the Moveable Fe begin again, obſerving the ſame Order in e ſubſequent as in the preceding Period.

PR

PROB. IV.

To find the Years of our Lord in the *Dio-*
an Period, anſwering to the preceding Data,
l conſequently in all other.

Here it muſt be obſerved, that the Year
he Birth of Chriſt, the *Cycle* of the Sun was
and the *Prime* 1. whence follows the Rule,

Add 9 to the Year of our Lord, and divide
28, the Remainder will be the *Cycle* of the
1.

Alſo add 1 to the Year of our Lord, and
ide by 19, the Remainder will be the *Prime*.

Whence the Problem is reduced to this, *viz.*
at Number is that to which if 9 be added,
l the Sum divided by 28, the Remainder
ll be any of the aforeſaid *Cycles* of the Sun,
poſe 12.

Likewiſe if to the ſame Number 1 be added,
l the Sum divided by 19, the Remainder
ll alſo be any one of the *Primes*, ſuppoſe 13.

By the laſt Condition of this Problem 'tis
in, that if nothing be added to the Num-
required, and the ſame be divided by 19,
t 12 will be the Remainder.

And as to the former, that if nothing be added to the ſame Number, 3 will then be the Remainder.

First, let the Quotient, when the ſame is divided by 19, be called *a*, and, when divided by 28, *b*.

Then 19 times *a*, with 12 the Remainder added thereto, will be equal to 28 times *b*, with 3 added to it, *viz.* $19a+12=28b+3$, which reduced will be $19a=28b-9$.

And here $28b-9$ muſt needs be (by Conditions of the Queſtion) a Multiple of *a*; but if from a Multiple of ſome Number there be taken another Multiple of the ſame Number, the Remainder ſhall be alſo a Multiple of the ſaid Number, or Nothing. *Euc.* 7 *lib.* *Prop.* V.

Wherefore let *a* here be ſuppoſed 1, or Unity, then $19a$, *viz.* 19 being ſubtracted from 28 times $b-9$, leaves 9 times $b-9$, which will alſo be a Multiple of 19 from above.

$$\begin{array}{rl} \text{Thus} & 28b-9 \\ \text{Subtr.} & 19 \\ \hline & 9b-9. \end{array}$$

Here, as this laſt Remainder is a Multiple of 19, ſo it conſequently will be diviſible thereby.

Next, as the Remainder is reduced to ſuch
ıll Terms, it will be ſeen as it were by In-
ction.

Whether if any of the nine Digits be taken
b, by which multiplying 9, the Co-efficient,
l 9 taken from this Product, the Remainder
ll be diviſible by 19, which Digit will be
Value of *b* required.

So here, firſt ſuppoſing 1 for the Value of *b*,
n 9 times 1 is 9, and 9 taken therefrom, 0
nains, and conſequently 0 will be the Quo-
nt when divided by 19; wherefore *b* is equal
1; and 28 times *b* more 3, as at firſt (*viz.*
) will be the Number anſwering both Con-
ions of the Problem, *viz.* which divided by
, leaves 12, and alſo divided by 28, ſhall
ve 3.

PROB. V.

Required the Year when the *Prime* is 5, and
Cycle of the Sun 6?

Here it is alſo plain, *viz.* inſtead of 1 be-
; added to the Number required, and 5 to
nain, when divided by 19, that if nothing
added, 4 will remain to anſwer the firſt Con-
ion of the Queſtion.

The laſt Condition is, that when 9 is added,
l the ſaid Number divided by 28, 6 ſhall re-
in, from whence it may be ſeen, that if
Difference, *viz.* 3, be taken from the Num-

ber

ber to which 9 was to be added, the ſame wi 3 leſs than it was, and at the ſame time if 9 added, it will then be 6 more, and conſequen when divided by 28, 6 will remain, which the Rule, *viz.* When any Number is to be vided by a given Number, to which a cer Number is firſt to be added, and at the Time there be required a Remainder leſs the ſaid Number to be added, their Differe ſubtracted from the Number ſo to be divi gives a Remainder which anſwers the Co tion of the Queſtion.

Accordingly the preſent Problem will as follows.

$$19a + 4 = 28b - 3$$

$$19a = 28b - 7$$

$$\frac{19}{9b - 7}$$

Herefrom the laſt Problem *b* will be found to be 5, and conſequently 28 times *b* 3 as at firſt equal to 137 is the Number re red, which will be found to anſwer the Co tions of the Problem.

In purſuing the Solutions according to firſt Data, it will be beſt to begin with the *Prime*, going thro' all the *Cycles* of ☉, the with the next, and ſo on to the laſt. By Method all the Anſwers, when rang'd in der, will be found as follow.

Y

	Years of Chriſt 1ſt Period of 532.	Years of Chriſt 2d Period. &c.
2 × 3 = 1596	31	1627
	42	1638
	53	1649
	126	1722
	137	1733
	148	1744
	221	1817
	232	1828
	316	1912
	395	1991
	479	2075
	490	2086

In this Example I have taken the Multiple 532, *viz.* 1596 to add to the Numbers in e firſt Period, (as being the neareſt to this entury) by which you have the Years of our ord from 1627 to 2086 both incluſive, and oceeding in this Manner with the next Mul- ple of 532, &c. they may be found *ad inſi- tum.*

By the like Method as the above Numbers ave been computed, may thoſe for finding *aſter*'s happening on any other Day of the onth whatever, within the Limits.

PROB. VI.

What Year of the *Dionyſian* Period was it hen Chriſt was born, the *Prime* being 1, and e *Cycle* of ☉ 9?

Here in this Caſe, as there is no Add
required, the Problem is, what Number is
which divided by 19, ſhall leave 1, and by
ſhall leave 9.

Which by the aforeſaid Rules will be f
as follows.

$$\begin{array}{r} 19a+1=28b+9 \\ 19a=28b+8 \\ 19 \\ \hline 9b+8 \end{array}$$

Here, as none of the nine Digits ca
found equal to *b*, the Proceſs muſt be c
on a Step forwarder upon this Conſidera
viz. as the Remainder $9b+8$ is a Multip
19 (ſuppoſing $a=1$ as before) therefore o
ſequence it will be diviſible thereby.

Next, let the Quotient, when ſo divi
be called *d*, and as the Quotient multipli
the Diviſor is ever equal to the Dividend,
$8=19d$, and

$$\begin{array}{r} 9b=19d-8 \\ \text{Suppoſing } b=2 \text{ ſub. } 18-0 \\ \hline \end{array}$$

Remainder will be $1d-8$ a Multip
9 or 0.

From whence 'tis plain, that the Digit
be the leaſt Value of * *d*; wherefore 19
d leſs 8 will be found to be 144, to wh

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* Taking $1d-8$ equal 0.

ıes *b* was equal, and conſequently *b* will be
ıal to one Ninth thereof, *viz.* 16, whence
times *b* more 9 (as at firſt) will be 457, the
ar of the *Dionyſian* Period required, which,
.en from 532, the Remainder 75 is what was
nting to compleat the ſaid Period at the Birth
our Saviour.

This laſt Operation, with the preceding, be-
; truly digeſted, no Difficulties can ariſe in
ɔblems of this Nature.

Beſides theſe two *Cycles*, there is another of
Years, called the *Roman Indiction*, which at
† vulgar Æra of the Birth of Chriſt, ac-
npting in a retrograde Order from its Inſti-
ion, will in that Caſe be found to be * 3;
ıerefore, if to the Year of our Lord 3 be ad-
l, and this Sum divided by 15, the Remain-
will be the *Indiction* required.

The Product made by the Multiplication of
ſe three *Cycles*, *viz.* 19 into 28, into 15,
7980, and is called the *Julian Period*, at the
piration of which Number of Years all the
ee *Cycles* begin again, as at firſt, and all the
aſts, *&c.* depending thereon, proceed in the
ıe Order alſo as when they firſt began.

The Number of each *Cycle* for any Time be-
; given, it will be eaſy purſuing the aforeſaid
:thod, to determine what Year of the *Julian*
riod, as alſo what Year of our Lord the ſame

Z z 2 PROB.

Which all theſe *Problems* reſpect.

For any Time farther back proceed in manner as for the other Cycles.

PROB. VII.

At the Birth of Chriſt the *Prime*, as before, being 1, the *Cycle* of the Sun 9, and that of the *Roman Indiction* 3. *Quere*, What Year of the *Julian Period* was it?

The Import of this *Problem* is to find a Number, when divided by 19, leaves 1, by 28, leaves 9, (which by *Problem* VI. was found † 457) and divided by 15, ſhall have 3.

Here, as 19 and 28 are *Primes* to each other, their Product, *viz.* 532, will be the leaſt common * Multiple to them, to which, or any Multiple thereof, if ‡ 457 be added, the ſaid Sum will ſtill have the ſame Property, *viz.* when divided by 19, to leave 1, and by 28, to leave 9.

Next, let the Number of Times that 53 is to be taken be called *a*, then $532a+457$ will, as before, ſtill retain the aforeſaid Property; the next Condition of the *Problem* is, tha when this laſt Sum ſhall be divided by 15, th Remainder ſhall be 3.

Laſtly, let the Quotient, when divided by 1 be called *b*, then (as before) will $15b+3$ be e qual to $532a+457$, from each of which Fac tors, after Reduction, take the greateſt Mul ple of 15, poſſible when in the firſt Factor will be found 35, and in the latter 30, multi plying each of which by 15, and their Produc reſpectively ſubtracted, the Remainder will ſti b diviſible by 15, when, proceeding as in the ceding *Problems*, you will have the Num- r ſought, as follows.

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† Year of the *Dionyſian* Period anſwering the above Data.
* *Vide* Page 53. Ex. III.
‡ *Vide* Prob. VI.

$$15b+3=532a+457$$
$$15b=532a+454$$
$$\text{Sub.}\ {}^{*}\ 525\ +450$$
$$\text{Rem.}\ 7a+4$$

Here *a* may eaſily be diſcovered to be 8, hence 532 into 8 more 457 equal to 4713, is e Year of the *Julian Period* required, by hich having the Year of our Lord, as alſo ny Number of Years before Chriſt, what Year the *Julian Period* the ſame is may be eaſily und.

P R O B. VIII.

When the *Prime* is 8, the *Cycle* of the *Sun* , and the *Indiction* 14, what Year of our Lord it?

Here the Import of the *Problem* is for the *rime*, to find a Number to which if 1 be added, and the Sum divided by 19, 8 ſhall remain, herefore, when nothing is added, conſequently will remain; next as 9 is always to be added o the Year of our Lord, and the Sum being divided by 28, the Remainder gives the *Cycle* ☉; o here, as 9 is to be the Remainder or *Cycle*, herefore there is no Occaſion for the Addition f 9 at all, whence it will be, taking for the Quotients *a* in the firſt Caſe, and *b* in the ſecond.

$$19a+7=28b$$
$$19a=28b-7$$
$$\text{Sub.}\ 19$$
$$\text{Rem.}\ 9b-7$$

---

* *b* in the firſt Factor is taken equal to 35, and in the latter 30.

Whence *b* may eaſily be diſcovered to be and conſequently 140 the Number anſwerin the firſt Conditions of the Queſtion.

Next, as in the *Indiction*, there is require 3 to be added to the Year of our Lord, and, when divided by 15, the Remainder will be th ſaid *Indiction*; therefore the preſent *Indictio* being 14, if the Number, without the ſai Addition of 3, be divided by 15, there i required 11 only to remain; wherefore,*

$$
\begin{aligned}
15b + 11 &= 532a + 140 \\
15b &= 532a + 129 \\
&\ 525\ \ + 120 \\
&\ 7a + 9
\end{aligned}
$$

Here *a* alſo, as it were by Inſpection, is foun to be 3, and 532 into 3, more 140, equal t 1736, the Year of our Lord required.

Having, from *Page* 49 to 57 incluſive, treated of Multiples, &c. I ſhall inſtance the tw following *Problems* on that Head.

PROB. IX.

Let it be required to find a Number, whe divided by 2, by 3, by 4, by 5, and by 6, Unity ſhall remain; but, when divided by 7, there ſhall be no Remainder.

The leaſt common Multiple to 2, 3, 4, 5, 6, will be found to be 60, to which, if Unity b now added, and the Sum be diviſible by 7, th

Problen

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* Aſſuming *a* and *b* for the Quotients, as in *Prob.* VII and VIII.

oblem will be anſwered; but, ſeeing it is , ſome Multiple of 60 muſt be ſought, to ich, if Unity be added, the ſame ſhall be di- ible by 7.

Wherefore, as by the former *Problems*, it ll be

$60a + 1$ to be diviſible by 7.
56
$4a + 1$ alſo diviſible by 7.

Whence *a* will be 5, and 301 the Number quired.

To which, if there be now added 420, the aſt common Multiple to 2, 3, 4, 5, 6, and , and ſo on, continually you will have An- vers *ad infinitum*.

PROB. X.

Let *a*, Number be required, when divided y 2, Unity ſhall remain, by 3, 2 ſhall remain, y 4, 3 ſhall remain, by 5, 4 ſhall remain, by , 5 ſhall remain, and when divided by 7, no- hing ſhall remain.

Here 5 is eaſily diſcovered to be the Num- er, when divided by 2 and 3, to anſwer ſo ar the Conditions of the *Problem*.

Next, the leaſt common Multiple to 2 and 3, is 6, wherefore

$$\dagger\ 6a + 5 = 4b + 3 \text{ and}$$
$$^{*}\,4b = {}^{*}\,6a + 2$$ where a, by Inſpectio is Unity, conſequently 11 anſwers the firſt thre Conditions.

Next, the leaſt common Multiple to 2, 3 and 4, is 12.

Therefore ‡ $12a + 11 = 5b + 4$ and

$$5b = 12a + 7$$
$$10 \quad -5$$
$$2a + 2$$ is diviſible b 5, wherefore a is 4, and $12a$ more 11, equ to 59, anſwers the firſt four Conditions.

The leaſt common Multiple to 2, 3, 4, an 5, is 60.

$$\text{Whence } 60a + 59 = 6b + 5$$
$$\text{And } 6b = 60a + 54$$

Here ‖ $60a+54$ is already a Multiple of ‖ 6 and conſequently, ſuppoſing a equal to 1, 11 anſwers the firſt five Conditions of the *Proble* and which, as is obvious, is alſo a Multiple o 7, and conſequently anſwers all the Condition required, thereby ſaving the carrying on o the Proceſs any farther.

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† Vide *Prob.* VII.

* When the Numbers are compoſed to one another, as here, *viz.* 4 b a 6 a, in ſuch caſe their greateſt Common Meaſure, or Unity, will alway the leaſt Value required, as above; otherwiſe the Queſtion will be imp ſible.

‡ Vide laſt *Caſe* and *Problem* VII.

‖ In this laſt Step 60 a is found to be a Multiple of 6 b, in ſuch C Unity will always be the leaſt Value of a, &c. required; when, if the ſolute Number ſhould not be alſo a Multiple thereof, the Queſtion will impoſſible.

To obtain the Years of the *Julian* and *Dio- ſian* Periods for any Number of Years before d after Chriſt.

The Year of the *Julian* Period at the Birth Chriſt being found, as before, to be 4713, . 357.) if the Number of Years ſince our viour be added thereto, and the Number of ears before ſubtracted therefrom, you will ve the Year of the *Julian* Period at that ime.

Alſo as the Year of the *Dionyſian* Period was und to be 457, (*p.* 355.) by ſubtracting the umber of Years before Chriſt, when under 7, therefrom, the Remainder will be the ear of the ſaid Period required; but if the umber of Years before Chriſt ſhould be great- than 457, ſubtract 457 therefrom, and di- de the Remainder (if capable) by 532, the umber of Years in the ſaid Period: this laſt emainder, if any (otherwiſe 532 is the An- er) being ſubtracted from 532, gives the Year the Period required; if the Remainder to divided by 532, be leſs than 532, ſubtract therefrom, which Remainder will then be the ear of the Period required.

If the Year of the ſaid Period be ſought at y Time after the Birth of Chriſt, inſtead of ding 457, and proceeding in manner as with e Cycle of the Sun, *&c.* as there then want- but 75 Years to compleat the ſaid Period, ould the Number of Years after Chriſt be der 75, ſubtract them therefrom, the Remainder will be the Number of Years ſtill wan ing to compleat the ſame, which ſubtracte from 532, gives the Year of the Period requ red; but when the Number of Years are grea er than 75, ſubtract 75 therefrom, the Remain der, if under 532, is the Year of the Cycle but if the ſaid Remainder be greater tha 532, divide it thereby, and this laſt Re mainder, if any, (otherwiſe, as before, 532 the Anſwer) will be the Number of the ſai Cycle required.

Let the Year of the ſaid Period be ſough at that of our Lord 1736, the Cycle o the Sun at the ſame time being 9, and th Prime 8.

1736 Year of Chriſt
75 Subt.

532) 1661 (3
65 Year of the Cycle required.

$$\left.\begin{array}{r} 19a+8=28b+9 \\ 19a=28b+1 \\ \text{Subt. } 19 \qquad 0 \\ \text{Rem. } \quad 9b+1 \end{array}\right\} \text{by } \textit{Prob}.\ \text{VI.}$$

Here b is equal to 2, and $28b+9$ equal t 65, as before.

The foregoing Problems, maturely con dered, will be found to extend to the Soluti of moſt of thoſe which are called *unlim* *Problems*.

Ol

Other Queſtions applicable to the CHRONOLOGER.

SUPPOSE a Perſon born *July* 17, 1671, What Day of the Week was it? This nay be ſolved by *Prob.* I.

The Month, Day of the Week, and Date of the Year being given, to find what Day of he Month it is.

By the ſaid *Problem* alſo may be found all the Days of the reſpective Month, which that Day of the Week can happen on in the ſaid Year when it will be one of them.

Suppoſe a Perſon in the Year 1736, ſhould be about 40 Years of Age, and knew not the Year, but that he was born on a Sunday, *Auguſt* 18.

Here it is eaſy to diſcover, that *Auguſt* 1. muſt fall on a Thurſday, and conſequently F always in that caſe be the *Dominical Letter*.

Next, let the Age be eſtimated at 40 Years, which ſubtracted from 1736, gives 1696, the Year of Birth, for which Year finding the Cycle of the Sun, it will be 25, and D the *Dominical Letter* anſwering thereto; but, as before, it muſt be F, which happen'd the Year preceding, which is obvious among the Cycles in the *Chronologer*; therefore his true Age was 41, and born in the Year 1695.

Suppoſe in the Year 1736, a Perſon ſhould only ſay, that he was born on a *Good-Friday*, *March* 23.

Here, as *Good-Friday* is on *March* 23. *Eaſter Sunday* will be on the 25th; when by *Problem* III. IV. and V. all the Times in 532 Years it can ſo happen are already found (ſee *p.* 353.) where the Years of our Lord are,

	Year of Chriſt.	*Age.*
1736	1627	109
	1638	98
	1649	87
	1722	14
	1733	3

So that the Perſon may be any of the above Ages, from which, if living, it will be no hard Matter to determine the Age, or if you think you have not given ſcope enough, take twice the *Dionyſian* Period, *viz.* 1064, to which adding the firſt Numbers, *p.* 353. you will have the Years of our Lord for the preceding Period, *&c.*

Other Varieties relating to the *Chronologer* may be eaſily deduced from theſe and the preceding Principles.

The *Returns* of the *Moveable Terms*, of which e *Chronologer* only takes notice (the other beng fix'd, therefore always the ſame) are thus enominated.

Eaſter-Term.

1ſt	Ret. from the Day of *Eaſter*	in 15 Days.
2d	Ditto - - -	in 3 Weeks.
3d	Ditto - - -	in 1 Month.
4th	Ditto - - -	in 5 Weeks.
5th	On the Morrow of the *Aſcenſion.*	

Trinity-Term.

1ſt	Ret.	On the Morrow of the *Holy Trinity.*
2d	——	In 8 Days, ditto.
3d	——	Fr. the Day of *H. Trin.* in 15 Days.
4th	——	Ditto, in 3 Weeks.

For the true Time of Eaſter.

Note, The firſt Full Moon that ſhall happen n or next after the Vernal Equinox, *viz.* when he *Sun* enters *Aries*, the *Sunday* following is *Eaſter-Sunday*; if the ſaid firſt Full Moon hould happen on a *Sunday*, then the next *Sunlay* after will be *Eaſter-Sunday*.

The Reaſon for poſtponing the *Sunday* is, hat the *Jews* always keep their Paſſover on he very Day of the firſt Full Moon on or next fter the ſaid Vernal Equinox, which, if as efore obſerved, ſhould happen on a *Sunday*, he *Chriſtians*, that it might not be thought to ſavour of *Judaiſm*, keep theirs on the *Sunday* (*viz. Lord's-Day)* following.

The Council of *Nice* in the Year of Chriſt 325, upon regulating the Feaſt of *Eaſter*, fix'd the Day of the Vernal Equinox on *March* 21. (tho' it really was, as may be eaſily found by Computation, on the 20th) and they, ſuppoſing the Vernal Equinox would always happen on the 21ſt of *March*, order'd *Eaſter* to be celebrated on the *Lord*'s-*Day*, &c. as before, following the next Full Moon after the ſaid 21ſt of *March*; from hence it may be ſeen, that when the Full Moon ſhall happen on a *Saturday*, *March* 21. *Eaſter-Sunday*, which, according to the above Rule, is to be the next *Sunday* following, will be on the 22d of *March*, and ſooner than this *Eaſter* can never happen.

Alſo, when the Full Moon ſhall happen on *March* 20. the Day preceding the Vernal Equinox, the next Full Moon after (the Space of a Lunation being 29 Days and a half) will not happen 'till *April* 18. which, if it ſhould be on a *Sunday*, then the *Sunday* following, *viz.* *April* 25. will be *Eaſter-Sunday*, and is the fartheſt that ever it can happen.

And this laſt Rule for finding *Eaſter* has prevailed ever ſince the ſaid Council of *Nice*, according to which and the *Metonic* Cycle of 19 Years (*viz.* the *Primes* or *Golden Numbers* which ſuppoſed the Lunations to return to the ſame Time, *viz.* Day of the Month, &c. as in each reſpective Year of the preceding Cycle) was the Table made for finding *Eaſter* for ever.

Bu

But neither the Vernal Equinox or *Metonic* ycle is permanent; for in the Space of 132 ears the ſaid Vernal Equinox will be anticiited a little above a Day (ſee *p.* 102.)

And the Mean Motion of the Moon in 19 eap (or 76) Years from the Tables is 3° 33′ 1″, that of the Sun 34′ 36″, neglecting the hirds, as being under 30, the Diff. 2° 58′ 54″ the Diſtance of the Moon from the Sun in 76 ears, the Diff. of the mean hourly Motion of ie Moon from the Sun is 30′ 28″; whence it ill be, as 30′ 28″ is to 1 ho. ſo is 2° 58′ 54″ 5 ho. 52′ 21″, one Fourth of which is 1 ho. 3′ 5″, and ſo much is the *Metonic* Cycle antipated every 19 Years, which in the Space of 10.6 Tropical Years amount to one Day.

From hence it may eaſily be computed, that e Equinox, ſince the Council of *Nice* to the ear 1736, is anticipated about 11, and the unations between 4 and 5 Days, and hence iſe all the Differences about celebrating the eaſt of *Eaſter*.

Pope *Gregory* XIII. with the Aſſiſtance of ie *Lilius*, in the Year of our Lord 1582, in der to reſtore the Vernal Equinox to the 21ſt *March*, as ſuppoſed at the Council of *Nice*, rew ten Days (at which time the Equiox was ſo much anticipated) out of the Calenr, making the 11th of *March* (the Day hereon the Vernal Equinox then happened) be the 21ſt; and in order to fix it there, orred every Hundredth Year, which ſhould be

Biſſextile, to be but a common Year, and thi for three Centuries ſucceſſively, and the fourt Century to be Biſſextile, and ſo on continually.

From hence it may be obſerved, that in 40 Years there are three Days provided for, in whic time the Sun's Mean Motion is 2° 57′ 25″; bu againſt 100 (anſwering to 400 Years) in th Table of the Sun's Mean Motion, &c. ever fourth or Leap-Year, the Equinox will be 3 2′ 8″ 8‴ anticipated; ſo that there will ſtill be the Anticipation of the Diff. *viz.* 4′ 43″ 8‴, to which anſwers 1 ho. 54′ 48″, &c. of Time, amounting in 50 Centuries to 23 ho. 56′ 24″, *i.e.* a Day wanting 3′ 36″.

Wherefore, if the laſt Year of every 50th Century had been alſo made a common Year, the Seaſons would thereby not be interrupted a Day in two Millions of Years.

There having been, from the Crucifixion to the Council of *Nice*, about 300 Years, the Vernal Equinox was at the ſaid Council anticipated at leaſt two Days, to which Time they ſhould alſo have gone back in this Regulation, in order to have kept up to the primitive Intent.

For the Time of Eaſter *in the* Gregorian Account.

Firſt, Find the mean Time of the Change of the Moon about the Beginning of *March*, as in *p.* 343. and here it will be beſt to operate with the true Place of the Sun on the Firſt of *March*, which is obtained accurate enough by always

ways adding to the Mean Place thereon 40′, which at a Mean will be found to an- 'er for 4000 Years, and may be obtained for er, thus,

Find the Mean Anomaly *March* 1. for the ear required, with which, taking out the E- ation of the Sun's Centre, you have the umbers ſought.

Next, adding 15 Days thereto, gives the ime of the Full Moon, which, if it ſhould ppen before the Vernal * Equinox, by adding Days and a half thereto, you will have the ɔſequent Full Moon, by which the true Time *Eaſter*, as in *p.* 365. may eaſily be diſco- red.

To the true Time of *Eaſter*, thus found, add e Number of Days before us in the *Gregorian ccount*, gives their Time of *Eaſter* required.

Example for the Year 1736.

The Year 1736, being the Radical Year, ere are no Equations to be applied to the lean Places of the Sun and Moon.

The true Place of the Sun on *March* 1. by lding 1° 40′ to the Mean, gives 11^{s} 22°, and at of the Moon nearly the ſame; wherefore e Moon changed on the ſaid 1ſt of *March* out Noon (which it did at 3h. P.M.)

Next, adding 15 Days, gives the 16th for e Day of the Full Moon, which, as C is the *ominical Letter*, fell therefore on a *Tueſday*, d conſequently the *Sunday* following, *viz.* *larch* 21. was the true Time of *Eaſter* †.

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* The Day of the Vernal Equinox is readily determined by adding a egree for each Day to the Place of the Sun on the Firſt of *March*.

† But *Eaſter* was not celebrated with us 'till our 25th of *April*, which five Weeks too late according to the primitive Deſign and Inſtitution.

To which adding the 11 Days before us i the *Gregorian Account*, gives *April* 1. the Tim of their *Eaſter* required.

By Note, *p.* 347, the *Gregorian Dominical Letters* will be found to be AG, which laſt i this caſe is to be made uſe of, and under it i the *Chronologer* the Months *April* and *J* in their Account both begin on a *Sunday*, a greeing with *Eaſter-Sunday*, as above.

The Time of *Eaſter* found, all the *Moveabl Feaſts*, being dependent thereon, are eaſily obtain'd by the *Chronologer*, as follows.

Example. For the Year 1736.

Eaſter-Sunday, is *April* 25.

25 Days in *April*, and 24 out of *March*, are 49 Days, or 7 Weeks; therefore *Shrove-Sunday* is —— —— —— *March* 7

5 Days remaining in *April*, and 34 more, make 39 Days, and *May* having 31 Days; therefore *Aſcenſion-Day* is —— —— *June* 3

5 Days in *April*, and 31 in *May*, are 36, and 13 more in *June*, make up 49, or 7 Weeks; therefore *Whit-Sunday* is *June* 13

Trinity-Sunday, being the next, is therefore *June* 20

And the *Dominical Letter* being C, *Advent-Sunday* is —— —— *November* 28, *&c.*

The *Terms* and their *Returns* are eaſily diſ-
vered by the ſame Method, &*c.*

Next to compleat an *Ephemeris* or *Diary* for
y Year. Firſt, find the Sun and Moon,
th the Nodes true Places at Noon, on the
rſt of *January*, with all the other Requiſites,
laid down by the *Chronologer*, by which you
ll diſcover the Diſtance of the Sun from the
oon, and by (*p.* 340. 343.) Rules beforegoing
e Day of the Change to this Day at Noon.
ompute again the true Places of the Sun and
oon alſo on the 7th, 15th, and 22d Days,
th before and after the ſaid Change; by their
aces thus at Noon may the Diſtance of the
oon from the Quarters and Oppoſitions of
e Sun be taken, which multiplied by 2, gives
e Hours, &*c.* to be applied to the Noon of
e ſaid Days, which gives the Time required.

Alſo, by the Diſtance of the Sun from the
ode, may be ſeen, when there will be an
clipſe of either Luminary, (ſee *p.* 292.)

For the *Riſings* and *Settings* of the Sun and
oon, as alſo the Moon's *Southing* (ſee *p.* 336,
c.)

For the Tides.

It is obſerved at *London-Bridge*, that at the
hange and Full of the Moon it is High-Wa-
r about half an Hour after Two of the Clock,
d at the Quarters about half an Hour after
ven.

Therefore, from the ſaid Change and F of the Moon to the Quarters, there are 5 ho Difference in the Tides.

Next, as the mean Time of a Lunation i 29 Days and a half, if the ſaid 5 ho. be di ded by one Fourth thereof, it will be abo 40 min. for the mean Time of the Tides eve Twenty-four Hours, and as there are tw Tides in that Time, it will be about 20 mi each Tide.

Again, from the Time of High-Water a the Quarters, *viz.* half an Hour after Seven, t that of the Full and Change, *viz.* half an Hou after Two, are ſeven Hours, which divided alſo by one Fourth of a Lunation, gives nearly an Hour in the latter Caſe for every Twenty-four Hours, *viz.* about 30 min. each Tide, and this will ever be found near enough in Practice, and within a few Minutes of the true.

By this Method, knowing the Times of High Water at the Change and Full at any other Place, the ſame at any intermediate Time may alſo be computed.

If you would ſtill be more exact, you muſt take the true Time between the Quarters, &c. of each Lunation, which may eaſily be done by the foregoing Methods, by which dividing the 5 and 7 Hours, as before, the reſpective Quotients give the Anſwers required.

All the preceding Calculi being made to the
hanges, Quarters, *&c.* of the Moon, as be-
re directed, for any Day between, as Occa-
on ſhall require, the ſame may be obtained
ith little more than Inſpection.

And here it may not be unworthy the No-
ce of an Ephemerediſt, who gives the Places
f the Sun each Day no farther than to Mi-
utes, that, if the Places of the Sun be obtain'd
ue for every Day in any one Year, (which I
ould chuſe to be *Biſſextile*) by applying thoſe
umbers only, which would reduce the mean
laces in the ſaid Year to the mean Places for
wenty Years ſucceſſively, to the true Places
efore found, you will thereby have the true
laces inſtead of the mean for the ſaid Num-
er of Years to about one Third of a Minute.

To the above Calculations you may likewiſe
ut the Day of the Week to the firſt Day of
ach Month, whence the other Days of the
Week, by the preceding Methods, are at any
ime eaſily obtained.

The Method, uſed in all Ephemerides and
Almanacks, is to put to the firſt Day of every
Year the Letter *a*, the ſecond Day *b*, the third
, and ſo on to *g*, the firſt ſeven Letters an-
ſwering to the firſt ſeven Days of every Year,
and that Letter, which anſwers to *Sunday*, is
always made a Capital Letter, and is called
Dominical, from pointing out the *Lord's-Day*,
or *Sunday*; ſo that whatever Letter points out
its reſpective Day in the firſt Week of the ſaid
Year,

Year, the ſame Letter points out the ſame Day of the Week throughout the whole Year.

If the Year begins on a *Sunday*, then a Capital A, being *Dominical*, points out not only that *Sunday*, but every *Sunday* in the Year, and the other Letters to *g* in ſmall Characters, each its reſpective Day throughout the Year, as before, which is obvious from the Notation.

Next, it may be obſerved, that in a Year of 365 Days, whatever Day of the Week the ſame begins on, the ſame Day thereof it will end: As for Example, let the ſame begin on a *Sunday*; the remaining Number of Days in the Year, *viz.* 364, divided by 7, the Days in each Week, gives 52 Weeks, and leaves no Remainder; whence conſequently, the Year will end alſo on a *Sunday*, and the ſucceeding Year will therefore begin on a *Monday*, *&c.*

But *a*, being put to the firſt Day of every Year, when the ſame does not begin on *Sunday* it muſt be a ſmall Letter; next, ſuppoſing it to begin on a *Monday*, count from *Monday*, calling it *a*, *Tueſday* *b*, *&c.* 'till you come to *Sunday*, to which the Letter G will now anſwer, and is therefore a Capital, as being the *Dominical* or *Sunday-Letter*.

Proceeding in the ſame manner, the next Year, which will begin on a *Tueſday*, F will be found to be the *Dominical Letter*, the following Year E, and ſo on, each Letter taking place, as *Dominical*, in a retrograde Order.

From whence 'tis plain, that if every Year onſiſted but of 365 Days, after ſeven Years ıe *Dominical Letters* would return again, proeeding in the ſame Order as before.

But every fourth Year, being *Biſſextile* or *eap-Year*, there is introduced another Day, which may be taken on the laſt, *viz.* on the hen 29th Day of *February*) and conſequently nother Letter to anſwer it, which will like- ⁊iſe bring another *Sunday-Letter* into the Acount, *viz.* the next of the ſeven preceding the ormer, which is the Reaſon why every *Leap- ear* there are two *Dominical Letters*, whence, nſtead of the Letters returning in the ſame)rder after every ſeven Years, as before, it will ow be four times Seven, or 28 Years, and on heſe Principles was the Table of *Dominical etters* and *Cycles* of the *Sun* compoſed.

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he *moſt remarkable and moſt certain* Epocha's *uſeful in* Chronology.

OLYMPIADS, Year of *Julian* Period —— —— 3938
commencing at the New Moon next after the Sum Solſtice, each containing 4 Years.

uilding of *Rome*, U.C. Year of the *Julian* Period according to *Varro* — 3961
according to *Faſti Capitolini* —— 3962
commencing *April* 21.

abonaſſar, *Feb.* 26, *Julian* Period —— 3967

)eath of *Alexander* the Great, *Nov.* 12. *Julian* Period — — — 4390

Julian, ſettling the Calendar by *Julius*
Cæſar, *Jan.* 1. *Julian* Period — 4668
Turkiſh, (Flight of *Mahomet*) *July* 16. d° 5335
Perſian, *June* 16. — — — 5345
Martyrs, firſt Year of *Diocleſian*, *Auguſt* 29.
Anno Domini — — — 28

Having *p.* 369. ſhewn how to find the *Gregorian Eaſter* for any future Time, it may not be amiſs to ſhew the ſame for any Time paſt.

Accordingly, let it be required for the Year 1670.

I ſhall work this Example by the *Tables*, after the Manner of diſcovering *Eclipſes*.

The Proſthaphereſis to be applied to the mean Place of the Sun (ſee *p.* 104.) will be ~~found about one Degree ablative~~; but at the ſame time there is $1^{\circ}\ 40'$ to be added for the true Place on the Firſt of *March*, the Difference therefore added, gives $11^{s}\ 21^{\circ}$ for the true Place of the Sun, and allowing about a Degree a Day, the Vernal Equinox will be found to fall on the Tenth of *March*.

The Proſthaphereſis for the Moon will be found * $7^{s}\ 27^{\circ}$ *ferè* additive, which ſubtracted from $11^{s}\ 21^{\circ}$ the above Place of the Sun, leaves $3^{s}\ 24^{\circ}$, which being ſought among the Mean Places of the Moon in the Tables, *March* 1736. the next neareſt thereto is $3^{s}\ 21$ and againſt it anſwers the tenth Day of the Month, to which adding 9° for the nine Days from the Firſt of the Month excluſive, gives

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* See *p.* 122, 123.

, to which now anſwers the 11th Day nearly r the Change of the Moon; next adding 15 ays thereto, gives 26th for the Day of Full oon, and, conſequently, the *Sunday* followng was the true Time of *Eaſter*.

The *Julian Dominical Letter* for the above ear is B, whence *March* begins on a *Tueſday*, nd the 26th, the Day of Full Moon, fell on a *aturday*; wherefore *Sunday* the 27th was the rue Time of *Eaſter* required.

But, before the Year of Chriſt 1700, the *regorian Account* was only ten Days before s, which added to the 27th of *March* before ound, gives *April* the 6th, the Time of their *Eaſter* required.

The *Julian Dominical Letter* being B, and he *Gregorian Account* 10 Days before us, by ounting 10 from B excluſive, among the ſeven *ominical Letters* immediately over the Months nd under the *Cycles* (ſee *p.* 305.) in a direct rder, you will end at E, which is the *Gregorian Dominical Letter*, (and which, in a retrograde Order, is the fourth preceding B) whence e Firſt of *April* begins on a *Tueſday*, and, onſequently, the 6th is on a *Sunday* as before.

The *Prime* for the ſaid Year was 18, by hich and the *Dominical Letter* our *Eaſter* will e found to have fell on *April* 3. but ſhould ave been on *March* 27. as above; wherefore was celebrated a Week too late.

The *Tables*, *p.* 285, 286 and 287, being t common, I ſhall give an Inſtance of their ſes.

Firſt, by former Rules *p.* 334. and Table, *p.* 277. find the Declination of the Moon.

Then, for her Meridian Altitude.

If the Declination before found, and the Latitude of the Place, be of one Denomination, *viz.* both North or both South, the ſaid Declination, in that caſe, being added to the Complement of the Latitude, gives the Meridian Altitude required.

But, if the Declination and Latitude of the Place be of different Denominations, their Difference will be the Meridian Altitude requir'd.

Next, for the Uſe of the aforeſaid *Tables.*

Let it be required to find the Time of the Tranſit of the Moon over the Meridian

	°	'	"
The Horizontal Diameter being		29	30
Declination	25	0	0
Meridian Altitude	63	0	0

		'	"
Moon's Horizontal Diameter	- -	29	30
For Declination 25°, *p.* 286.	- +	3	2
For Alt. 63°, *p.* 274. at a Mean		0	28
		33	0
Againſt which in the *Table* of the Rotation of the Earth, *p.* 285. are about 2 ¼, and the Moon's Mean Motion anſwering thereto, *p.* 202.		1	14
		34	14

Againſt 30′ 5″ in the aforeſaid *Table* of Rotation are 2′, when there will be the odd 4′ 9″ to proportion for; thus, as 15′ 2″ (which 2″ may be neglected) are to 1′ of Time, ſo are 4′ 9″ to 16″ 36‴, which, as the Thirds are above 30, may be taken 17″, and ſo the whole Time of the Tranſit will be found 2′ 17″.

It will be very eaſy at any Time from theſe *Tables*, &c. for an Obſerver ſo to elevate his Mural Quadrant, as never to miſs the Object; which Mural Quadrant, according to the new Methods of Obſerving, with all other Mathematical Inſtruments, are made in the moſt accurate and approved Manner, by *Tho. Heath*, Mathematical Inſtrument-Maker, in the *Strand*.

The Methods for finding the Moon's Southing by the *Chronologer*, tho' very near, yet is not exact enough to compare with Obſervation, for which Purpoſe on that Day at Noon, whereon the Obſervation is to be made, you muſt compute the true Places of the Luminaries, &c. and from thence their Right Aſcenſions in Time in Hours, Minutes, Seconds, &c. Then from the Right Aſcenſion of the Moon, thus found, ſubtract that of the Sun, adding 24 ho. if Occaſion; next, for this Difference in Hours &c. find the true Place of the Moon again, as alſo her Right Aſcenſion in Time, from whence ſubtracting the Right Aſcenſion of the Sun in Time, as before, gives her true Time of Southing required; to which laſt Time the Moon's Apparent Place muſt now be found.

Hitherto the Centre of the Moon has only been conſidered; but if it be required to know when her Limb or Diſk ſhall touch the Meridian, then her Semi-diameter muſt be conſidered; when, if ſhe be between the Chang and the Full, it will be her Weſtern Limb, a which Time her Semi-diameter muſt be ſubtracted from her aforefound Place; but, if it b between the Full and Change, it will be her Eaſtern Limb, when the ſaid Semi-diamete muſt be added, *&c.*

The Computations at the End are deſign'd a Examples to be traced over at any Time.

The third is that for the Eclipſe of the Moon, *March* 15. 1736. in which is omitted the 2d Equation according to Sir *Iſaac*, amounting to 3′ 33″ ablative; alſo the fourth Equation amounting to 1′ 51″ likewiſe ablative, bot which are 5′ 24″, making it above 9 Minutes in Time later than by the ſaid Computation †.

† *See the* Preface.

There are * 3′ 33″ ſhort of the Oppoſition denoted by the Aſteriſm, which requires 6′ 6 of Time for the true Oppoſition, as found by the Difference of the Hourly Motion of the Sun from the Moon, in which Time the Sun will be advanced 15″ forward, making his Place 0ˢ 6° 36′ 35″, and that of the Moon the direct Oppoſite, from which laſt Place of the Moon the true Place of the Node is there taken, and the Moon's Latitude found accordingly.

This Eclipſe happening when the Moon was upon the Meridian, her Altitude was 41 Deg. and being very near the Perige, her Semi-diameter is therefore increaſed by 12″ (ſee *p.* 274)

The Place of the Moon is alſo computed for an Hour forwarder, to gain her true Motion for that Time, which is 37′ 20″, when if the ſame be obtained by the Method, *p.* 301. with 6 52″, preſent Horizontal Parallax, which the by Miſtake was taken 60′ 51″, it will be foun to be 37′ 19″, and is within a Second of th by Computation.

Th

The Computation *of the ſaid* Eclipſe *on the aforeſaid Principles, compared with* two Obſervations, *taken out of the* PHILOSOPHICAL TRANSACTIONS, Nº 445. Anno 1737.

Obſervation by *John Bevis*, *M.D. Covent-Garden*, *March* 15. 1736.	h.	′	″		By *Computation*, *March* 15. 1736.	h.	′	″		Obſervation by Mr. *George Graham*, *Fleet-ſtreet*, *March* 15. 1736.	h.	′	″	
Beginning	10	11	40	P.M.	Beginning	10	12	39	P.M.	Beginning	10	13	0	P.M.
Total Immer.	11	10	0		Total Immer.	11	10	47		Total Immer.	11	11	0	
Emerſion not taken					Emerſion	12	50	1		Emerſion	12	49	0	
* End Shad.	13	48	30		End Eclipſe	13	48	9		End Eclipſe	13	47	0	

From whence it is obvious, that the Equant computed by Mr. *Machin*, renders the aforeſaid Equations of the Theory, as noted in the *Preface*, of no Uſe in the Syzygys.

* In this Computus there are 50 Seconds added for the Earth's Atmoſphere.

The fourth and laſt Computus is for the O cultation of *Aldebaran*, in which the Place the Moon is computed for half an Hour fore, &c.

Or the Hourly Motion of the Moon out o the Syzygys may be obtained by the followi Method.

Firſt, find it as if in the Syzygys (ſee *p.* 30 which in this Example will be found 29′ 24″ next, take out the Difference of the Variation between the preſent Sign and Degree, and ne greater Degree of ☉ à ☽ the ſecond Time E quated (which in this Example are $5^{s}\ 4^{\circ}$ an $5^{s}\ 5^{\circ}$, and the Difference 42″) half of th Difference muſt always be ſubtracted from 34″, and the Remainder, when the Variation was added, be ſubtracted from, and when ſubtracted, added to the Motion, as if in the Syzygys before found; half of the Difference in this Example is 21″, which ſubtracted from 34″, leaves 13″ to be added by the above Rule to the Motion before found, *viz.* 29′ 24″, which gives 29′ 37″; laſtly, obſerve the like with the Reduction to the Ecliptic, half of which Difference, applied as the *Table* directs, to this laſt Motion found, gives the true Hourly Motion of the Moon out of the Syzygys required.

In this Example the ☊ à ☽ in her Orbit is $9^{s}\ 24^{\circ}$, between which and $9^{s}\ 25^{\circ}$ are 9″ Diff. of Reduction, half of which, *viz.* 4″, applied as the ſame was increaſing, according to the Title of the *Table*, *viz.* added to 29′ 37″, before found

und, gives 29′ 41″ for the true Hourly Mo-
ɔn of the Moon out of the Syzygys required,
lf of which, *viz.* 14′ 50″ is equal to the
lf Hourly Motion by Computation, ſee the
mputus, &c.

Note, If the ☋ ã ☽ in her Orbit had been
°, or 5° 3°, the Difference in that Caſe
ɔuld be 9″ decreaſing, when the Half, *viz.* 4″
uſt, contrary to the Title, be ſubtracted in-
ad of added, as before, which is very obvious.

The farther Calculi of this Occultation are
t for the Exerciſe of the Curious, and here
is to be noted, that the *Computus*, according
the Theory, is 4′ ſhort hereof, ſee *p.* 164
d 331.

APPEN-

APPENDIX.

THE Contraction in *Diviſion of Decimals*, not being of ſo general Uſe as in *Multiplication*, was forgot to be inſerted in its proper Place; and leſt the Theory thereof may not be though perfect without it, obſerve the following Rule

Having determined the Value of the firſt Digit of the Quote, proceed therewith as uſual; next, inſtead of bringing down to the Remainder a Cypher or Digit each Time from the Dividend, point off a Place in the Diviſor, not making uſe of any Digit, &c. in the Product made by the Digit in the Quote and Diviſor, 'till you come to that Place in the Diviſor immediately preceding, to the Left-hand, the Place laſt pointed off in the Diviſor; continue thus 'till the Diviſion be ended, having regard at the ſame time (as in Contraction of *Multiplication*) of the Carriage from a Place or two in the Diviſor, to the Right-hand o the Place pointed off therein.

This will be made plain from the following Examples.

Exampl

Example I.

384.672158) 14169.2066239510 (36.8345
262904188
32100893
1327121
173105
19236
(0002)

Here the Place of Unity in the Product,
de by the firſt Digit in the Quote and U-
s Place in the Diviſor, fell under 6 among
: Integers in the Dividend, which being the
ıce of Tens, the Value of the Place of the
t Digit of the Quote will be ſuch *.

Example II. *in Circulates.*

Here I ſhall reſume the *Example*, *p.* 90.]

$$\begin{array}{rr} 2.1\cancel{7}\cancel{2}\,) & 243.\cancel{3}0\cancel{6}30 \\ 21 & 243306 \\ \hline 2.151 & 240.87\cancel{3}2\cancel{4}\,(\end{array}$$

In this caſe the Diviſor, as conſiſting of the
ſt Number of circulating Places, is firſt
ar'd (ſee *p.* 89.) next the Diviſor muſt now
ordered according to the Number of circu-
ıng Places in the Dividend, as follows.

D d d 2.151

---

* See *pag.* 40.

```
2.151          240.87324
   2151           24087
-------        ---------
2.148849 ) 240.63237 ( 111.982
   .....      257474
               42589
               21101
                1763
                  44
                 (1)
```

If this Example be compared with the ſame in *p.* 90. the Truth of operating in this contracted manner will evidently appear.

Here it may alſo be obſerved, as before, that the Units Place of the Diviſor falls under the Place of Hundreds among the Integers in the Dividend, and conſequently the firſt Figure of the Quote will be of the ſame Value in Place.

Or, by *Example* VI. *p.* 38. a Cypher muſt be added to the Dividend to make the decimal Places therein equal to thoſe in the Diviſor, when the Quote will be ſo far Integral, and contain three Integral Places, as above.

When the Number of circulating Places in the Dividend are leſs than in the Diviſor you muſt proceed in like manner, clearing the Dividend firſt, next the Diviſor, *&c.*

In the following Computation by the *Chronologer* it will be neceſſary to inſpect the Pages referr'd to for the Work.

As *July* 23. was nearer the Firſt of *Auguſt*
n the Firſt of the ſaid Month, the Mean
ces on the ſaid Firſt of *Auguſt* are therefore
de uſe of, and the Mean Motions for the
mber of Days, by which it exceeds the
d 23d of *July*, *viz.* 9, ſubtracted therefrom,
ich Method (in the like Caſes) will be al-
ys beſt to be purſued.

(1)

COMPUTATION *of the* Places *of the* LUMINARIES, July 23. 1738. *at Noon*, *by the* TABLES. Equal Time.

☉'s Mean Longitude.	☉'s Mean Anomaly.	
s ° ' " ''' 4 12 18 35 8 1736, July 23. − 28 39 26 +2 Ye. à Rad. 4 11 49 55 42 1738 July 23. −1 3 9 42 Equ. ☉ Centre 4 10 46 46 ☉ true Place	s ° ' " 1 4 3 29 1736 July 23. −30 41 +2 Ye. à Rad. 1 3 32 48 1738 July 23. $\underbrace{32\ 48}_{.547}$	' " Equation Ti. ☉ Place ± 9 50 D° ☉ Anomaly − 4 12 True Equation of Time + 5 38
☽'s Mean Longitude.	☽'s Apogé.	☽'s ☊.
s ° ' " 3 0 21 20 1736 July 23. +8 18 46 7 +2 Ye. à Rad. 11 19 7 27 1738 July 23. +6 34 First Equation 11 19 14 1 ☽ 1ſt Ti. Equated. +5 32 43 Ellipt. Equation	s ° ' " 11 15 18 13 1736, July 23. +2 21 19 41 +2 Ye. à Rad. 2 6 37 54 1738 July 23. −11 55 First Equation 2 6 25 59 Apo. 1ſt Ti. Equat. 2 4 40 47 D° à ☉	s ° ' " 5 29 36 26 1736, July 23. −1 8 39 26 +2 Ye. à Rad. 4 20 57 0 1738 July 23. +4 51 First Equation 4 21 1 51 ☊ 1ſt Ti. Equated. 11 19 44 55 D° à ☉.

11 24 46 44	☽ 2d Ti. Equated.
+32 19	Variation.
11 25 19 3	☽ in her Orbit.
—6 52	Reduc. and Exceſs.
11 25 12 11	☽ in the Eclipt.

Mean Elliptic Equa.	+6° 17′ 12″
Reduction d°	— 44 29
True Elliptic Equa.	+5 32 43

+10 52 4	2d Equ. Apog.
2 17 18 3	Tr. Pl. Apog.
9 1 55 58	☽ Mean Anom.
2 28 4 2	Compl. d°
7 13 59 58	☉ à ☽ 2d Ti. Equ.

Conſtant Log. —— 9.957762

44° 2′ 1″	½ Mean Ano.	
+11	Equ. to d°	
44 2 12	Tangent.	9.985393
41 15 99	Tangent.	9.943155
2 46 22	Diff. à ½ Mean Anom.	
×2		
5 32 44	True Ellipt. Equation.	

4 20 30 23	Tr. Pl. ☊.
17 15	Incl. Limit.
7 4 48 40	☊ à ☽'s Orbit.
3 0 58	☽ Lat. So. Aſcen.

(2)

COMPUTATION *of the* Places *of the* SUN *and* MOON, July 23. 1738. *at Noon, by the* CHRONOLOGER. Equal Time.

☉ Me. Long.		
s ° ′ ″		
4 21 10 50	1736, Aug. 1.	
—8 52 15	* Days to go back	9
4 12 18 35	1736, July 23.	
—28 40	+2 Ye. à Rad.	
4 11 49 55	1738 July 23.	
—1 3 9	Equ. ☉ Centre	
4 10 46 46	☉ true Place	

☉ Me. Anom.			
s ° ′ ″			
1 12 55 42			
—8 52 13			
1 4 3 29			
—30 40			
1 3.32.49			
.547	Eq. Ti. ☉ Pl.	+9′	50
	D° Anom.	—4	12
	Tr. Eq. Ti.	+5	38

Equ. ☉ Cent. at 1ˢ 4° Ano.		—3835″
D° ——	1 2 d°	—3633
Diff. Increaſ.	2	202
Diff betw. next leſs and preſ. Ano. Increaſ.		1°.547
3633″ againſt 1ˢ 2° Ano.		202″
+156 Propor. Pts.		3094
3789 Eq. ☉ Cent. —		3094
		2)312″.494
		156

---

* See the Work, p. 392.

☽ Me. Long.				
s	°	'	"	
6	28	56	35	Aug. 1.
+4	20	10	52	* Days to go back 9
11	19	7	27	1758. July 23.
		+6	34	† 1ſt Equation
11	19	14	1	☽ 1ſt Ti. Equat.
	+5	32	43	‡ Elliptic Equation
11	24	46	44	☽ 2d Ti. Equat.
		+32	19	Variation
11	25	19	3	☽ in her Orbit
		+6	50	Reduc. and Exceſs
11	25	12	13	☽ in Eclip.

	°	'	"
Me. Ellipt. Equ.	+6	16	34
Reduction		43	51
	+5	32	43

☽ Apoge.				
s	°	'	"	
11	16	18	22	
+2	20	19	32	* Days to go back 9
2	6	37	54	
		−11	56	† 1ſt Equation
2	6	25	58	Apo. 1ſt Ti. Equat.
2	4	20	48	D° à ☉
	+10	50	38	2d Equ. Apoge
2	17	16	36	Tr. Pl. Apog.
9	1	57	25	☽ Me. Anom.
2	28	2	35	Compl. d°
7	13	59	57	☉ à ☽ 2d Ti. Equ.

☽ Node ☊				
s	°	'	"	
5	29	7	49	
−1	8	10	45	* Days to go back 9
4	20	57	4	
		+4	52	† 1ſt Equation
4	21	1	56	☊ 1ſt Ti. Equat.
11	19	44	50	D° à ☉
	10	15	10	Compl. d°
		−30	38	2d Eq. ☊ In. Lim. 18'
4	20	31	18	Tr. Place ☊
7	4	47	44	☊ à ☽ in her Orbit
	3	0	0	☽ Lat. So. Aſcen.

---

* See the Work, p. 392. † See ditto, p. 395. ‡ See ditto, p. 394.

⊙ Mo. *per Diem* ——	.98565	⊙ Ano. *per Diem* ——	.9856
Days to go back	9	Days to go back ——	9
	8°.87085		8°.8704
	60		60
	52′.2510		52′.224
	60		60
	15″.060		13″44

Work to the *Computus*, by the *Chronologer*, *p.* 391.

☽ Mean Motion 1 Year ——— Cir. .359401
à Rad. 2 Ye. ——— 2

Cir.
☽ Me. Mo. 1 Day .036601 ——— + .718802
— .329410

Days to be deducted 9
—.32941

+.389392
6*

2336352
6*

4s 20° = *140°.18112
60

10'.8672
60

52''.032

Mean Eccentricity ——— 5505
Preſent ——— 4860

Difference ——— 645

Conſtant Differ. between Me. and leaſt Eccentr. 1173

Diff. betw. Me. and leaſt Equa. 4785'' from Tab. Red.

Then, as 1173 : 645 :: 4785'' : 2631'', *viz.*—43'51''
Reduct. Me. to the true Ellip. Equa. as above.

* *N.B.* Multiplying by 6, and that Product again by 6, and next pointing off one Place leſs for Decimals in the laſt Product, is multiplying the firſt by 360, *&c.*

Work to the *Computus*, by the *Chronologer*, *p.* 391.

				Cir.					Cir.
Me. Mo. ☽ Apo. 1 Ye.				.11295	Me. Mo. ☊ 1 Ye.				.05369
à Rad. 2 Ye.				2	à Rad. 2 Ye.				2
				.22591					.10738
				6					6
				1.35546					.64428
				6					6
Me. Mo. Apo. 1 Day	6′ 41″			*81°.3280	Me. Mo. ☊ 1 Day	3′ 11″			*38°.6568
Days to be deducted	9			60	Days to be deducted	9			60
	60′ 9″			19′.68		—28′39″			39′.408
				60					60
				40″.8					24″.48

Work to the *Computus*, by the *Chronologer*, *p.* 391.

Eq. ⊙ Cent. —3789″
×r. to 1ſt Equation .104
15156
3789
1ſt Equa. ☽ +394″.056

Eq. ⊙ Cent. —3789″
×r. .18
9)30312
33680
3789
1ſt Equa. Apo. —715″.70

Eq. ⊙ Cent. —3789″
×r. .077
26523
26523
1ſt Equa. ☊ +291″.753

(3)

COMPUTATION *of the* Places *of the* LUMINARIES, March 15. 1736. *at* 12 *ho.* P. M. Equal Time.

☉'s Mean Longitude.

s ° ′ ″ ‴
~~4 10 30 18 1736, March 29.~~
— 29 34 10 +2 Ye. à Rad.
0 4 40 6 28 1738 March 15.
+1 56 13 45 Equ. ☉ Centre
0 6 36 20 13 ☉ true Place

☉'s Mean Anomaly.

s ° ′ ″
~~8 25 56 47~~
+29 34
8 26 26 21
.44
Eq. Ti. ☉ An. +7 45
D° Place −2 10
Tr. Eq. Ti. +5 35

Equation ☉ Centre.

Againſt 8s 27° ☉ Anom. 1° 56′ 16″
D° 8 26 D° 1 56 12
Difference increaſing 4
.44° × 4″ = 1″45‴ + 1°56′12″ = 1°56′13″45‴

☽'s Mean Longitude.

s ° ′ ″
5 27 24 47 1736 March 15.
+6 35 18 +2 Ye. à Rad.
6 3 59 45 1738 March 15.
−12 5 Ann. Equation
6 3 47 40 ☽ 1ſt Ti. Equated.
+2 45 11 Ellipt. Equation

☽'s Apogé.

s ° ′ ″
11 00 49 14
+3 21
11 00 52 35
+21 56 Ann. Equation
11 1 14 31 Apo. 1ſt Ti. Equat.
1 5 21 49 D° à ☉

☽'s ☊.

s ° ′ ″
6 6 29 29
−1 35
6 6 27 54
−8 54 Ann. Equation
6 6 19 0 ☊ 1ſt Ti. Equated.
6 0 17 20 D° à ☉.

6 6 32 51	☽ 2d Ti. Equated.
−4	Variation.
6 6 32 47	☽ in her Orbit.
* 3 33	Short of the Oppoſi.

☽ Me. Long. computed 1 h. forward.

s ° ′ ″	
6 3 47 40	☽ 1ſt Ti. Equat.
32 56	☽ Me. Mo. an ho.
6 4 20 36	☽ dº Equ.
+2 43 55	Elliptic Equation
6 7 9 31	☽ 2d Ti. Equat.
+36	Variation
6 7 10 7	☽ in her Orbit
6 6 32 47	Dº as above ſub.
37 20	☽'s Ho. Mo.

+10 38 54	2d Equ. Apog.
11 11 53 25	Tr. Pl. Apog.
6 21 54 15	☽ Mean Anom.
5 8 5 45	Compl. dº
5 29 56 31	☉ à ☽ 2d Ti. Equ.

☽ ~~Apoge computed~~ 1 h. forwarder.

s ° ′ ″	
11 1 14 31	1ſt Ti. Equ. as above
+17	Me. Mo. an ho.
11 1 14 48	Apo. dº Equat.
1 5 24 0	Dº à ☉
+10 39 20	2d Equ. Apoge
11 11 54 8	Tr. Pl. Apog.
6 ~~22 26 28~~	~~☽ Me. Anom.~~
5 7 33 32	Compl. dº
6 0 30 43	☉ à ☽ 2d Ti. Equ.

−55	2d Eq. In. Li. 17 45
6 6 19 55	Tr. Pl. ☊.
16 40	☊ à ☽ in her Orbit
1 46	☽ Lat. No. Aſcen. at ☋ Orbit

☉ tr. Pl. 1 h. forw. $0^s\ 6^\circ\ 38'\ 48''$

	′	″
☽ Horizontal Parallax —	60	52
Dº Semi-diameter —	16	40
☉ Dº — —	16	6
☽ Hor. Mo. Orbit —	37	20
☉ Dº — —	2	28
☽ Dº à ☉ —	34	52
~~Reduc. à ☋ Orb. to Mid. Ecl.~~		−7
+ to Semi-diam. ☽ for Alt.		12

(4)

1738, Equal Time.
Dec. 12. 6ho. 43′ 10″ P. M.

s	°	′	″	1738, D° ☽ Mean Longitude.
2	3	51	40	
		+1	20	Ann. Equation
2	3	53	0	☽ 1ſt Ti. Equ.
	+2	37	17	Ellip. Equ.
2	6	30	17	☽ 2d Ti. Equ.
		−27	52	Variation
2	6	2	25	☽ in her Orbit.
		+5	12	Reduc. and Exc.
2	6	7	37	☽ in Eclipt.

☉ true Place
s ° ′ ″
9 1 51 18

Eq. Ti. ☉ Pl.	+40″
D° Anom.	−51
Tr. Eq. Time	−11

s	°	′	″	☽ Apoge.
2	22	29	0	
		−2	25	Ann. Equation
2	22	26	35	Apo. 1ſt Ti. Eq.
6	9	24	43	D° à ☉
	+3	16	34	2d Equ. Apo.
2	25	43	9	Tr. Pl. do
11	8	9	51	☽ Me. Anom.
0	21	50	9	Compl. d°
5	4	38	59	☉ à ☽. 2d Ti. Eq.

☉ Mean Anomaly
s ° ′ ″
5 23 45 40

s	°	′	″	☽ Node ☊.
4	13	24	55	
			+59	Ann. Equation
4	13	25	54	☊ 1ſt Ti. Equ.
	−1	28	48	2d Equ. ☊ In. Li. 10′ 3″
4	11	57	6	Tr. Pl. ☊
9	24	5	20	☊ à ☽ in her Orb.
	4	33	26	☽ Sĩm. Lat. Incr. 16′ 12″
		9	11	Pref. Inc.
	4	42	37	☽ tr. Lat. S. def.

	°	′	″
Me. Ellip. Equation	+2	13	58
Reduc. d°		+23	19
True Ellip. Equation	2	37	17

Computation for ½ ho. back ☉ and ☽

s	°	′	″	
2	3	36	32	☽ 1ſt Ti. Eq. ½ h. bac.
	+2	39	4	Ellip. Equa.
2	6	15	36	☽ 2d Ti. Equa.
		−27	59	Variation
2	5	47	37	☽ in her Orbit
		+5	10	Reduc. and Exc.
2	5	52	47	

True Long. Aldeb. at Time above.
♊ 2ˢ 6° 7′ 35″

s	°	′	″	
9	1	50	1	☉ tr. Pl. ½ ho. back
2	22	26	27	Apo. 1ſt Ti. Equ. d°
6	9	23	34	D° à ☉
	+3	16	10	2d Equ. Apo.
2	25	42	37	Tr. Pl. Apo.
11	7	53	55	☽ Me. Anom.
0	22	6	5	Compl. d°
5	4	25	35	☉ à ☽ 2d Ti. Equ.

Horizontal Parallax	53	40
☽ d° Semi-diameter	14	44
☽ Horary Motion	29	41

Latitude Aldebaran.
5° 29′ 50″

s	°	′	″	
5	23	44	26	☉ Me. Ano. ½ ho. back
4	13	25	58	☊ 1ſt Ti. Equ. d°
4	18	24	3	D° à ☉
	−1	28	48	2d Equ. ☊
4	11	57	10	☊ tr. Pl.
9	23	50	27	☊ à ☽ in Orbit
	4	33	57	☽ Sim. Lat. In. 16′13″
		9	11	Preſ. Incr.
	4	43	8	☽ Tr. Lat. So. deſcen.

Work to *Computus* (3.) p. 396, 397.

		°	′	″
Mean Elliptical Equation	—	+2	28	47
Reduction d°			+16	24
True Elliptic Equation	—	+2	45	11

9.947865 Conſtant Log.
10.712569 Tang. ½ Comp. ☽ Me. Ano.—1′ 4″

10.660434 Tang. 77° 40′ 17″ which ſubtracted from ½ Comp. ☽ Me. Ano. 79° 2′ 52″. ½ and Rem. × 2 is Ellipt. Equa. &c. as above.

		s	°	′	″
☉ true Place an Hour forwarder	—	0	6	38	48

		°	′	″
Mean Elliptic Equation	—	+2	32	12
Reduction d°	—		+16	24
True Ellipt. Equa. 1 h. forwarder		+2	48	55

FINIS.

ERRATA.

For	Page	Lines	Margent	Read
PAges 124, 128, 167, 168, 169, 170, 172, 173, 174,				224, 218, 177, 178, 179, 180, 182, 183, 184
	8	5		*dele* to
Decimal, only	10	25		Decimal only,
.005	15	8		.007
(In Operation 1.) 9	21	7		.9
.27	60	11		.27
.27	ib.	12		.27
.27	ib.	14		.27
48	ib.	15		.48
124568	62	2		12.4568
6.545	63	4		6.545
23.23984	66	14		23.23984
70005.99999	73	11		70004.99999
11198	77	14		111.98
1	82	7		3
300837	ib.	17		30.0837
6.012	84	10		6.012
.22	86	2		.2
.2727	ib.	9		.27, &c.
.27	ib.	10		.27, &c.
.99, &c.	ib.	18		.9, &c.
above	102	19		as above
Seventh	136	5		Sixth
Apoge 3 13	143	11		2 13
$11^s\ 29^\circ\ 59'\ 38''$	172		19	$10^s\ 29^\circ\ 59'\ 38''$
$9^s\ 20^\circ\ 59'\ 56''\ 12'''$	179		31	$9^s\ 20^\circ\ 59'\ 56''\ 11'''$
Sine	182 183 184	3		Sign
3 3	185		20	3 32
(under Apoge) $10^s\ 18^\circ\ 35'\ 33''$	191		24	$10^s\ 28^\circ\ 35'\ 33''$
$19^s\ 27^\circ\ 2'\ 59''$	194		20	$10^s\ 27^\circ\ 3'\ 59''$

For	Page	Lines	Margent	Read
(Title) Sub.	210			add, and *è contra*
1 5	212	Bottom	Sign	11 5
2' 56"	221	App.° 2	70	1' 56"
14 22	222	d° 17	22	13 22
13 53	223	d° 17	66	14 53
17 7	ib.	d° 14	80	16 7
41 38	247	d° 19	72	41 48
♑	267	Bottom	Signs	♐
Suns	272	line 2		Sun
at the End of the Title	273	3		inſert ☉ à ☽
North	282	Bottom	Title	South, and *è contra*
Againſt ♈ and ♊	290			inſert M. C.
Againſt ♋ and ♍	291			inſert M. C.
which 2	296	17		next 2
+17°.060648	339	20		−17°.60648
fourth	347	7		ſecond
Herefrom	352			Here, from
16' 24"	400	1 h. forw.		16' 42"

N. B. The Numbers ſee the laſt Paragraph, *p.* 110. as alſo the Remainders, *p.* 167. ſhould have been as in *p.* 101 and 10 but the Differences being ſo very inconſiderable, they nee not be altered.

CORRECT TABLES

FOR

Obtaining, with Accuracy, the Right Aſcenſions of the MOON, &c. with Latitude; inſtead of Pages 282, 283.

Proſthaphereſes to the * Tables of Right Aſcentions of the Points of the Ecliptic, for Points of the Zodiac having Lat.

Longitude.	Lat. North in ♈ ♉ ♊ Lat. South in ♎ ♏ ♐ } Subtract									Longitude.
	1°			2°			3°			
	°	'	"	°	'	"	°	'	"	
♈ ♎	0	23	55	0	47	50	1	11	47	30
3	0	23	54	0	47	50	1	11	48	27
6	0	23	50	0	47	43	1	11	49	24
9	0	23	44	0	47	31	1	11	23	21
12	0	23	35	0	47	15	1	11	0	18
15	0	23	23	0	46	51	1	10	26	15
18	0	23	8	0	46	28	1	9	44	12
21	0	22	50	0	45	48	1	8	53	9
24	0	22	30	0	45	7	1	7	53	6
27	0	22	5	0	44	19	1	6	43	3
♉ ♏	0	21	38	0	43	25	1	5	23	♍ ♓
3	0	21	7	0	42	24	1	3	52	27
6	0	20	33	0	41	16	1	2	11	24
9	0	19	55	0	40	1	1	0	19	21
12	0	19	13	0	38	37	0	58	14	18
15	0	18	27	0	37	6	0	55	57	15
18	0	17	38	0	35	27	0	53	29	12
21	0	16	44	0	33	40	0	50	48	9
24	0	15	46	0	31	44	0	47	54	6
27	0	14	45	0	29	41	0	44	49	3
♊ ♐	0	13	39	0	27	29	0	41	31	♌ ♒
3	0	12	30	0	25	10	0	38	2	27
6	0	11	17	0	22	44	0	34	21	24
9	0	10	1	0	20	11	0	30	30	21
12	0	8	41	0	17	30	0	26	27	18
15	0	7	19	0	14	45	0	22	18	15
18	0	5	44	0	11	44	0	17	50	12
21	0	4	28	0	9	0	0	13	36	9
24	0	2	59	0	6	1	0	9	6	6
27	0	1	30	0	3	1	0	4	34	3
30	0	0	0	0	0	0	0	0	0	0
Longitude.	1°			2°			3°			Longitude.
	Lat. South in ♑ ♒ ♓ Lat. North in ♋ ♌ ♍ } Add									

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* Pages 278, 279.

Proſthaphereſes to the Tables of Right Aſcenſions of the Points of the Ecliptic, for Points of the Zodiac having Lat.

Lat. North in ♈ ♉ ♊ } Subtract
Lat. South in ♎ ♏ ♐ }

Longitude.	4°			5°			6°			Longitude.
	°	'	''	°	'	''	°	'	''	
♈ ♎	1	35	46	1	59	48	2	23	54	30
3	1	35	49	1	59	54	2	24	4	27
6	1	35	39	1	59	44	2	23	55	24
9	1	35	20	1	59	23	2	23	32	21
12	1	34	51	1	58	48	2	22	53	18
15	1	34	8	1	57	57	2	21	55	15
18	1	33	13	1	56	51	2	20	38	12
21	1	32	7	1	55	31	2	19	5	9
24	1	30	49	1	53	55	2	17	12	6
27	1	29	17	1	52	2	2	14	59	3
♉ ♏	1	27	32	1	49	52	2	12	55	♍ ♓
3	1	25	32	1	47	24	2	9	30	27
6	1	23	18	1	44	38	2	6	12	24
9	1	20	49	1	41	33	2	2	51	21
12	1	18	5	1	38	8	1	58	26	18
15	1	15	7	1	34	20	1	53	54	15
18	1	11	44	1	30	13	1	48	58	12
21	1	8	10	1	25	46	1	43	37	9
24	1	4	18	1	20	56	1	37	48	6
27	1	0	10	1	15	45	1	31	34	3
♊ ♐	0	55	45	1	10	12	1	24	53	♒ ♌
3	0	51	5	1	4	21	1	17	51	27
6	0	46	9	0	58	9	1	10	21	24
9	0	40	59	0	51	38	1	2	29	21
12	0	35	36	0	44	56	0	54	22	18
15	0	29	58	0	37	47	0	45	44	15
18	0	24	2	0	30	21	0	36	46	12
21	0	18	17	0	23	3	0	27	54	9
24	0	12	14	0	15	26	0	18	41	6
27	0	6	8	0	7	44	0	9	22	3
30	0	0	0	0	0	0	0	0	6	0
Longitude.	4°			5°			6°			Longitude.

Lat. South in ♑ ♒ ♓ } Add
Lat. North in ♋ ♌ ♍ }

Proſthaphereſes to the * Tables of Right Aſcentions of the Points of the Ecliptic, for Points of the Zodiac having Lat.

Longitude.	Lat. North in ♈ ♉ ♊ Lat. South in ♎ ♏ ♐ } Subtract									Longitude.
	1°			2°			3°			
	°	′	″	°	′	″	°	′	″	
♈ ♎	0	23	55	0	47	50	1	11	47	30
3	0	23	54	0	47	50	1	11	48	27
6	0	23	50	0	47	43	1	11	49	24
9	0	23	44	0	47	31	1	11	23	21
12	0	23	35	0	47	15	1	11	0	18
15	0	23	23	0	46	51	1	10	26	15
18	0	23	8	0	46	28	1	9	44	12
21	0	22	50	0	45	48	1	8	53	9
24	0	22	30	0	45	7	1	7	53	6
27	0	22	5	0	44	19	1	6	43	3
♉ ♏	0	21	38	0	43	25	1	5	23	♍ ♓
3	0	21	7	0	42	24	1	3	52	27
6	0	20	33	0	41	16	1	2	11	24
9	0	19	55	0	40	1	1	0	19	21
12	0	19	13	0	38	37	0	58	14	18
15	0	18	27	0	37	6	0	55	57	15
18	0	17	38	0	35	27	0	53	29	12
21	0	16	44	0	33	40	0	50	48	9
24	0	15	46	0	31	44	0	47	54	6
27	0	14	45	0	29	41	0	44	49	3
♊ ♐	0	13	39	0	27	29	0	41	31	♌ ♒
3	0	12	30	0	25	10	0	38	2	27
6	0	11	17	0	22	44	0	34	21	24
9	0	10	1	0	20	11	0	30	30	21
12	0	8	41	0	17	30	0	26	27	18
15	0	7	19	0	14	45	0	22	18	15
18	0	5	44	0	11	44	0	17	50	12
21	0	4	28	0	9	0	0	13	36	9
24	0	2	59	0	6	1	0	9	6	6
27	0	1	30	0	3	1	0	4	34	3
30	0	0	0	0	0	0	0	0	0	0
	1°			2°			3°			
Longitude.	Lat. South in ♑ ♒ ♓ Lat. North in ♋ ♌ ♍ } Add									Longitude.

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* Pages 278, 279.

Proſthaphereſes to the Tables of Right Aſcenſions of the Points of the Ecliptic, for Points of the Zodiac having Lat.

Lat. North in ♈ ♉ ♊ }
Lat. South in ♎ ♏ ♐ } Subtract

Longitude.	4°			5°			6°			Longitude.
	°	′	″	°	′	″	°	′	″	
♈ ♎	1	35	46	1	59	48	2	23	54	30
3	1	35	49	1	59	54	2	24	4	27
6	1	35	39	1	59	44	2	23	55	24
9	1	35	20	1	59	23	2	23	32	21
12	1	34	51	1	58	48	2	22	53	18
15	1	34	8	1	57	57	2	21	55	15
18	1	33	13	1	56	51	2	20	38	12
21	1	32	7	1	55	31	2	19	5	9
24	1	30	49	1	53	55	2	17	12	6
27	1	29	17	1	52	2	2	14	59	3
♉ ♏	1	27	32	1	49	52	2	12	55	♍ ♓
3	1	25	32	1	47	24	2	9	30	27
6	1	23	18	1	44	38	2	6	12	24
9	1	20	49	1	41	33	2	2	51	21
12	1	18	5	1	38	8	1	58	26	18
15	1	15	1	1	34	20	1	53	54	15
18	1	11	44	1	30	13	1	48	58	12
21	1	8	10	1	25	46	1	43	37	9
24	1	4	18	1	20	56	1	37	48	6
27	1	0	10	1	15	45	1	31	34	3
♊ ♐	0	55	45	1	10	12	1	24	53	♒ ♌
3	0	51	5	1	4	21	1	17	51	27
6	0	46	9	0	58	9	1	10	21	24
9	0	40	59	0	51	38	1	2	29	21
12	0	35	36	0	44	56	0	54	22	18
15	0	29	58	0	37	47	0	45	44	15
18	0	24	2	0	30	21	0	36	46	12
21	0	18	17	0	23	3	0	27	54	9
24	0	12	14	0	15	26	0	18	41	6
27	0	6	8	0	7	44	0	9	22	3
30	0	0	0	0	0	0	0	0	6	0
Longitude.	4°			5°			6°			Longitude.

Lat. South in ♑ ♒ ♓ }
Lat. North in ♋ ♌ ♍ } Add

ERRATA.

For	*Page*	*Line*	*Marg.*	*Read*
	8	5		*dele* to
Decimal, only	10	25		Decimal only.
(In Operation 1.) .005	15	8		.007
—— 9	21	6		.9
27	60	11		.27
27	ib.	12		.27
27	ib.	14		.27
48	ib.	15		.48
6.545	63	4		6.545
23.23984	66	14		23.23984
70005.99999	73	11		70004.99999
	76	17		*dele* 2
11298	77	14		11198
1	82	7		3
300837	ib.	17		30.0837
6.012	84	10		6.012
every	85	22		any
Page 45	ib.	29		Page 46
22	86	2		.2
27	ib.	9		.27
.99, *&c.*	ib.	18		.9, *&c.*
$47'$	97	4		$47''$
9.5016	98	9		3.5016
$14'''\ 16''''\ 43'''''$	101	*ult.*		$14'''\ 15''''\ 35''''' \frac{1}{2}$
above	102	9		as above
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35 Sec.	124	1		5 Sec.
from the fifth	135	21		from ☽'s the fifth
ſeventh	136	5		ſixth
$60^{\circ}\ 10'$	140	11		$6^{s}\ 10^{\circ}$
$3'\ 13''$	143	11		$2'\ 13''$
will be found	162	34		may be taken
$5^{\circ}\ 23''$	164	3		$5^{s}\ 23^{\circ}$
1 3 20 28	167		900	1 3 20 48
6 20 52 8	168		9	6 20 52 48
$10^{s}\ 17^{\circ}\ 51'\ 1''\ 49'''$	ib.		28	$10^{s}\ 17^{\circ}\ 51'\ 0''\ 49'''$
8^{s} 9 9 36	169		ib.	8 10 9 36
8 10 8 44	ib.		29	8 11 8 44
1336	170	2		1736

Computation of the Places of the LUMINA

☉ LONGITUDE.					Rad. Mon. Day and Year.	
s	°	′	″	‴		
0	12	3	38	57	*March* 23,	1736
	+	12	19	15	Hou. P. M. 5	
		+2	10	36	Min. 53	
			+2	16	Sec. 55	
0	12	18	11	4	Sum	
		+1	49	17	Ye. á Rad.	+4
0	12	20	0	21	*March* 23, &c.	1740
	+1	55	50	46	Equat. ☉ Centre	
0	14	15	51	—	☉ true Pla. eq. Ti. as above	
0	14	15	59		*ditto* apparent *ditto*	

☉ ME.	
s	°
9	3
	–
9	4
9	4
0	12
3	8

	☽ LONGITUDE.				Rad. Mon. Day and Year.	
	s	°	′	″		
	9	12	50	8	*March* 23,	1736
		+2	44	42	Hou. P. M. 5	
		+	31	18	Min. 57	
				+3	Sec. 6	
	9	16	6	11	Sum	
+	5	20	42	49	Ye. à Rad.	+4
	3	6	49	0	*March* 23, &c.	1740
		—	12	3	Firſt Equation	
	3	6	36	57	☽ firſt time equated	
		+4	15	16	Elliptic Equation	
	3	10	52	13	☽ ſecond time equated	
			+4	0	Variation	
	3	10	56	13	☽ in her Orbit	
			+1	47	Reduc. and Exceſs	
	3	10	58	0	☽ in the Ecliptic	
		—	15	12	☽ Semi-Diam.	
	3	10	42	48	☽ Weſtern Limb	

	☽	
	s	°
	11	1
	11	1
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	4	14
		+
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		5
	+	11
	4	2
	10	
	1	2
	2	2

☽ Excentricity — 50461
☽ Horiz. Parallax 54′.40″

☽ Hor. Semi-Dia. } 15′.0″
☽ Altitude 62° } +12
☽ App. Sem. Dia. 15.12

ES,

NOMA

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POGE.

42 4
+1 2
+ 1

44 2
46

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21 5

52 18

23 +1

·395

45 43

38 1

58 56

·082

1 4

·027

30 14

·604

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